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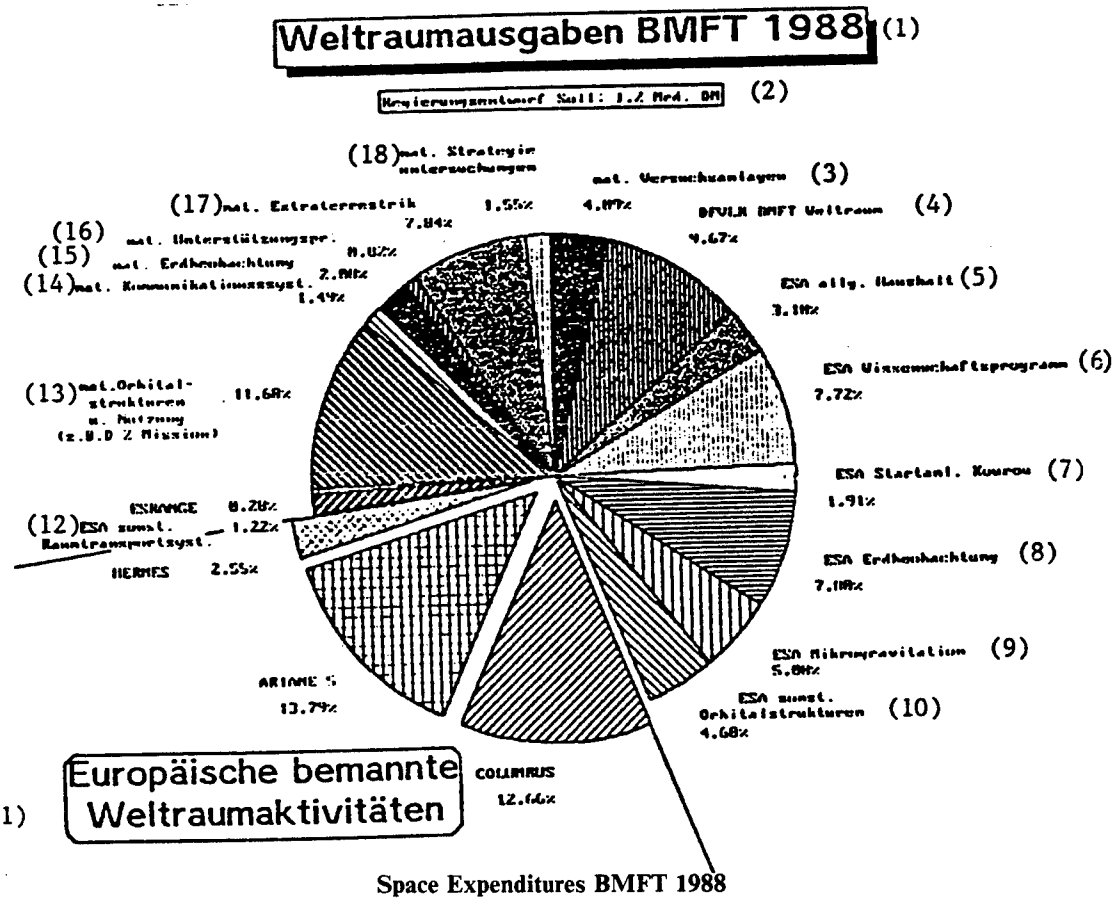
FRG Role in ESA Manned, Unmanned Space Programs Examined

1988 Research Budget Outlined

3698M122 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 467, 15 Nov 87 pp 2-3

[Text] The economic burden of space research, development of new space technologies, and utilization of space for research purposes will remain within acceptable limits for the FRG in the near future. This was stressed by FRG Research Minister Dr Heinz Riesenhuber during a press conference on budget questions and the future FRG policy for space research.

At present, space research in the FRG is handled primarily by the BMFT [Federal Ministry for Research and Technology]. A classification according to intended use results in the following distribution (projected 1988 budget):



Space Expenditures BMFT 1988

Key:

1. 1988 BMFT aerospace expenses projected
2. Government estimate: DM1.2 billion
3. Nat. experimental stations
4. DFVLR BMFT aerospace
5. ESA total budget
6. ESA scientific program
7. ESA launching platform in Kourou
8. ESA earth observation
9. ESA microgravity
10. ESA special orbital installations
11. European manned aerospace activity
12. ESA special space transportation systems
13. Nat. orbital installations and related exploitation (for ex. D-2)
14. Nat. commuunications system
15. Nat. earth observation
16. Nat. subsidies
17. Nat. extraterrestrial sciences
18. Nat. strategic surveys

Further development in the near future will be as follows:

The present long-term program of the ESA [European Space Agency] is in large part consistent with the foreseeable development of space policy. The BMFT must incorporate its long-term planning into the national research planning for space activities. It must be considered that the expenditures for space research and technology must fit into the overall system of policies and available funds. FRG participation especially in the ESA programs proposed by ESA, including a national R&D program up to the year 2000, is estimated to average DM2.7 billion per year, thus assuming a 2.5 percent growth rate. An alternative program [which would not require] subsidies at manned space flights would cost only 37 percent less in comparison to the ESA long-term program up to the year 2000.

Neither Hermes nor Columbus [programs] would be carried out, and the national manned space activities would be terminated with D-2. By doing so, the FRG would abandon this technological option. The program would then be reduced on average by DM1.7 billion per year.

Between these two extremes, according to Riesenhuber, there is the "space program of common sense and balance." In this case the cost of DM2.2 billion per year up to the year 2000 would be about 19 percent lower than in the long-term ESA program with related national space research, and about DM0.5 billion higher than if the FRG abandoned manned space activities. With DM6.3 billion in 13 years, that is, not even 500 million per year, the FRG in cooperation with European countries would have access to new developments in space technology that will be possible with manned space missions. But also in the program which the FRG is going to propose to its partners, priority is given to the utilization and development of space technology and the expansion of knowledge without the direct involvement of humans in space. For a "future" premium of DM500 million per year, the FRG would have access to new technologies which in the final analysis would be available and useful for mankind in the next century as well.

Considering space expenditures, the political question is reduced to the following problem:

—If the FRG completely gives up participating in manned space flights, both European and through partnership with the United States, it would reduce its space research expenditures up to the year 2000 by 22 percent compared to the strategies presented above.

—This strategy paves the way to further development of today's space technology together with the option of autonomous Euorpean access to space, also in manned space flights.

—A complete execution of the ESA long-term program together with a related national program and therefore stronger involvement in autonomous European manned space flights leads to the estimated 22 percent increase in expenditures as compared to the variation preferred by the federal government.

—The advantage for the FRG lies in the fact that this space program would allow a more intensive exploitation of space technology for mankind in all areas. Technological developments in manned space flights will soon be promoted as an option for the future.

Participation in Manned Flights

3698M122 Duesseldorf VDI NACHRICHTEN in German 20 Nov 87 p 2

[Article by Wolfgang Mock: "A Number of Questions Remain Open"]

[Text] VDI-N, Duesseldorf, 20/11/87—The FRG has decided to massively join manned space flights within the European framework. This means that the contours of research subsidy in our country will change in the long-term. Space flights replace nuclear technology as the new large scale technology and will concentrate on itself a similar amount of research funds.

The decision to participate in the program of the European Space Agency, ESA, will cost the FRG approximately DM 30 billion up to the year 2000, roughly DM2.2 billion per year. Out of this amount, DM600,000 will be allocated to participate in the Ariane 5 launcher, the jointly developed Hermes shuttle, and the space platform Columbus. Riesenhuber wants this additional amount of DM600,000 to be understood as a "premium for the future" to be paid for accessing the new technologies of manned spaceflights.

Only 3 of the 13 ESA member states seemed to be really interested in this premium for the future: France with a share of 45 percent for Hermes and Ariane and 13 percent for Columbus, the FRG with 22 percent for Ariane, 30 percent for Hermes, and 38 percent for Columbus, and Italy (Hermes 15 percent, Columbus 25 percent, Ariane 15 percent). This way all three countries carry almost 80 percent of all three projects, the interest of the remaining ESA members was between rejection and a maximum participation of up to 7 percent in individual projects.

As was to be expected, the British remained completely outside. They only wanted to participate—maybe—in Columbus with 18 percent, a reverence to the "special relationship" which connects Maggie Thatcher with Ronald Reagan.

The present configuration of the Hermes, Ariane, and Columbus projects is a compromise between the maximum requirements of the French and total rejection by

the British. The ESA members in their decisions of November 10 followed the FRG in a reduction of funds by almost 15 percent over the next 13 years.

The ratification of the present ESA program is anyway hardly more than a declaration of intentions with a lot of question marks. Only the project for the new Ariane 5 launcher is without problems. The agreements with the U.S. regarding civil use have not been reached by far nor have the still open legal questions in connection with the Columbus platform [been answered]. As to Hermes, at present, only an agreement on the extension of the planning period to the end of 1990 has been reached.

Josef Vosen, the technology policy spokesman of the SPD party (Social Democratic Party) thinks that the ESA resolutions are "not more than resolutions on paper"—at least from the German point of view. More so, because Finance Minister Stoltenberg has not made "one single DM" (Vosen) available for this new project—and hence for the related additional expenditures for space flights in the amount of DM600,000 per year. Also, the amount of DM361 million, the estimated cost of Hermes planning during the next 3 years has not yet been entered in the budget and may be reshuffled within the yearly German ESA contribution. Where the DM2 billion which are due for Ariane 5 are supposed to come from, is also not clear. If Stoltenberg refuses in the long-term to carry half of the new cost of space flights—as proposed by Riesenhuber—the Federal Ministry for Research will have no other choice than to double its present 13 percent share for space flights in its research budget of DM7.6 billion. "This," says Vosen, "will encounter bitter resistance by the SPD." They should be able to count on support by vast areas of basic research, but also by industry, at least on this point.

BMFT Space Policy Criticized

3698M122 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 468, 27 Nov 87 p 5

[Text] Prof Heinz Staab, the president of the Max Planck Society (MPG) thinks that there is no scientific justification for the projects regarding the participation of Europeans in manned space flights which have just been passed in principle by the research ministers of 13 ESA member states. During the yearly press conference of the largest German scientific organization,Staab emphasized that the decision for manned space flights depend to a large extent on foreign and domestic policies such as the requirement for European autonomy in space flights and its integrating effects on the cooperation between Europeans. Staab pointed out that 3 years ago the presidents of all research and science institutions presented their reservations against space flight projects in a letter to Federal Chancellor Kohl in connection with their concerns for possible aggravating cutbacks of funds for general basic research.

The MPG president demanded therefore that the funds for space flight projects be made available as an addition to the federal research budget. Staab made it clear that numerous scientific space flight projects could easily be realized unmanned and would therefore be much more cost efficient.

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Overview of Austrian Space Activities, Plans

36980062 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 14 Oct 87 p 8

[Article by Eht: "Austria Seeks Linkup with European Space Business"]

[Excerpts] Vienna—Since 1 January of this year Austria has belonged to ESA, the European Space Agency. It took this important step at the same time as Norway because it hopes to make important progress in the key technology of space flight by working with the other West European countries.

The organization responsible for scientific, technological, and financial coordination of the Austrian space program is the Austrian Solar and Space Agency (ASSA), headquartered in Vienna. "Thus far, thanks to this organization, 98 percent of the money contributed to ESA has come back to Austria in the form of research and development contracts," stressed Research Minister Dr Heinz Fischer in the latest activity report. "However, at 0.004 percent of the gross national product, Austria's spending on space projects is still very low compared to the other small ESA countries."

An important prime industrial contractor for space activities in Austria is Oesterreichische Raumfahrt- und Systemtechnik GmbH (ORS). This was founded in 1983 as a joint subsidiary of Austria Metall AG and the FRG's Dornier System GmbH. ORS headquarters in Vienna directs the technical installation in Berndorf, Lower Austria; among the major areas of activity are cooling systems, microgravitation installations, and ground installations for communications satellite systems. "Since 1975 Austria has spent about DM45 million for space projects," explains Dr Georg Serentschy of ORS. "Our firm, for instance, supplied the special window for the European manned research laboratory, as well as important parts for the ground installations for the Giotto project to study Halley's Comet and for the Olympus multipurpose communications satellite." Since 1983 Schrack Elektronik AG has also been involved in Austrian space projects. At present this private company is working hard to expand in three main areas: microwave technology, optoelectronics, and rapid data processing. These technologies play an increasingly important role in radar observation of the earth's surface such as ERS-1, the first European earth study satellite, will

carry out. For this project—as for satellite communications in general—it is necessary to process large quantities of data in a short time; also using higher frequency bands is expected to make this possible.

Space activity is increasing in Austria since that country joined ESA; it concentrates on, for instance, Eureca, the free-flying research platform; on the various windows for the Columbus space station; and on the water supply and kitchen equipment for Hermes, the planned European space glider. Austrian experts are making an effort to specialize in the study of biological processes in closed life cycles such as will be required for long space flights to the planets. "If we are to make a meaningful contribution to European space flight, however, it will be necessary to raise the Austrian space budget considerably, from DM35 million at present to DM70 million in 1990," stressed Dr Serentschy during his presentation to German space journalists. "Even then, Austria will be contributing barely 1 percent of the ESA budget."

12593

Netherlands Government Takes Control of Fokker

36980111 Duesseldorf HANDELSBLATT in German 18/19 Dec 87 p 15

[Article by jh: "Fokker: Vote Planned on Rescue Package. EEC Commission Must Also Approve. State Takes Control of Aircraft Builder"]

[Text] HANDELSBLATT, Thursday, 17 Dec 87; Brussels—In the future the Netherlands Government will have the decisive voice in the affairs of Amsterdam aircraft builder Fokker NV although it intends to acquire only 49 percent of the company. According to the terms of the rescue package worked out in mid-October between The Hague and the banks, the state will acquire a majority of the 50 priority shares currently held by major shareholders ABN (17), Vmf Stork (17), and America's Northrop Corp. (17). The holders of these special shares have decisive influence on the membership of the board of directors and managing board. They can also change the company charter.

Next Tuesday shareholders will vote on the rescue program in a special meeting. It is not certain whether the state will be able to acquire the holding it desires all at once. The banks ABN, Amro, and NIB are increasing their short-term lines of credit to 550 million guilders and their medium-term ones to 275 million guilders. The state will contribute 212 million guilders to increase the private and guarantee capital and to acquire 26 priority shares.

The rescue operation became necessary after the aircraft builder got into serious liquidity problems. High development costs, the low dollar, late delivery of the new F-50 and F-100 models, and last but not least management errors plus an overtaxed management board were cited as causes of the problems.

New shares will be issued to permit the state to buy into the company. With an issue price of 20 guilders per 10-guilder share (current price about 21.50 guilders), current shareholders will have the right of first purchase at a ratio of one to one. However, Economics Minister De Korte hopes that shareholders will not take advantage of this right. If contrary to expectations they do so, further shares will be issued. If the state then acquires more than 49 percent, the additional shares will be sold on the stock market.

The Government has made implementation of the plan dependent on agreement from both houses of Parliament as well as from the EEC Commission. As of today the Commission has not received the documentation, according to an EEC spokesmen.

Of the extensive measures which De Korte has demanded in exchange for the financial aid, one has been fulfilled in principle. Two new management-board members will be proposed to the shareholders on Tuesday. At present the board consists of only the chairman. The management board will be supplemented by a so-called advisory council. The Government also demands that costs, which have gotten out of control in recent years, be reduced by 200 million guilders by 1990. Preferably before the end of that same year the troubled aircraft builder must also enter into a cooperative agreement or even a merger with one or more firms in order to strengthen its position in the market. One possible partner might be Germany's MBB. A few weeks ago the two companies signed a statement of intent to increase their cooperation.

12593

Hermes in Wind Tunnel Tests in Bremen

36980121a Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 21 Dec 87 p 8

[Article: "Hermes Shuttle in the MBB Wind Tunnel: Aerodynamicists Determine Best Possible Form of Glide After Reentry"]

[Text] Frankfurt—In the Bremen wind tunnel run by the MBB transport and commercial aircraft group, the first aerodynamic measurements on a model of the European space shuttle, Hermes, have begun. The model being measured here represents an innovation in production technology, Messerschmitt-Boelkow-Blohm GmbH reports. For the first time, work is being done at MBB with a computer system that is able to convert the three-dimensional shape of the shuttle from the screen directly into commands controlling a milling machine in the central MBB milling center in Varel, near Wilhelmshaven, according to the company. This system, which is called Catia (Computer Graphics Aided Three Dimension Interactive Application), is intended to speed up the entire working process, increase production accuracy and significantly diminish potential sources of error.

In contrast to the American space shuttles, Hermes will not have its own propulsion unit. Thus, the spacecraft must reach the earth like a glider. After its reentry into the atmosphere at around 25 times the speed of sound (7.8 kilometers per second), Hermes must demonstrate airplane capability throughout the entire velocity range until landing. However, the demands and stresses differ considerably in the various velocity ranges. At high velocities, there are serious temperature stresses. This is part of the reason for the spacecraft's stocky design featuring a blunt nose. In the subsonic range, good gliding capability and effective controllability are necessary, since Hermes must land like a glider, without the help of an engine. One problem is that different shapes are required for an optimal flight in the various velocity ranges, such as the hyper-, super- and subsonic ranges. For example, the front part of the body is constructed with the demands of hypersonic speed in mind, while the wing size and the size of the rudder units and control surface are determined by speed during the landing approach. This requires a great deal of research and development for the landing.

Photo Caption

The aluminum model of the Hermes hangs from thin steel wires in the inverted position. This is helpful in measuring the force that the wind exerts on the model, MBB reports. This force is transmitted through the wires to a highly accurate balancing system above the working section and evaluated electronically.

12271

FRG: Restructuring of Aerospace Sector in 1988

36980121c Duesseldorf HANDELSBLATT in German 24 Dec 87 p 8

[Article: "Aerospace: Coordinator Counts on Decision on Restructuring in 1988: Riedl Argues in Favor of MBB-Dornier Merger"]

[Text] Munich, 23 Dec 87—The coordinator of the German aerospace industry and state secretary in the Federal Ministry for Economics, Dr Erich Riedl, foresees good opportunities for a change in the structure of this sector in 1988. "When should it happen if not next year," Riedl emphasized, noting that a number of decisions that are important to this sector will have to be made in 1988.

For this reason, Riedl would welcome a fundamental decision on a restructuring of the shareholding situation at MBB during the first 5 months of 1988. Ultimately, a budgetary decision on the Jaeger 90 should also be made, the need for which in terms of defense policy is backed up by the Hardthoehe. The coordinator of the German aerospace industry regrets that this will involve cooperation between four countries instead of five, with France not included.

Riedl said that if the decision is made for the Jaeger 90, then other resolutions must also be made by the industry with respect to development and production problems. He made no secret of the fact that he would prefer to see the German aviation industry speak with one voice amidst international competition. In the meantime, he said, the Americans have already distributed most of the contracts for their space station, meaning that it can be feared that German industry will get little business there.

It is possible to conclude from these statements that Riedl is arguing in favor of concentrating the German aerospace industry—thus Messerschmitt-Boelkow-Blohm GmbH (MBB) and Dornier—under one roof, and thus under the management of Daimler-Benz. However, as state secretary in the Ministry for Economics, he did not want to prejudice the decision by the Federal Antitrust Office. Nevertheless, he did not conceal the fact that he considers competition between MBB and Dornier on international projects to be outdated. However, it could take 5 to 7 years before these structural changes in the aerospace industry are completed, since they can be implemented only in stages. The federal government is only a catalyst here, not a direct actor.

The falling dollar is reportedly causing increasing concern for the Airbus family. For this reason, Riedl is unwilling to rule out the possibility of "special regulations" if the dollar continues to weaken. He noted that government decisions are due on this in the first half of 1988, and that the Americans are afraid of Airbus competition. For this reason, the talks concerning joint production between MBB and McDonnell Douglas in order to get around possible U.S. import barriers are to be welcomed.

The decision on a German space agency is also to be made in early 1988. Bonn and Munich are under consideration as the location of headquarters. Riedl would prefer an institution with public-law status, but a corporation would also be possible.

12271

FRG: Better Focus for DFVLR Activities

36980121b Duesseldorf HANDELSBLATT in German 24 Dec 87 p 8

[Article: "DFVLR: Kroell Warns Against Budget Cuts: Riesenhuber Stresses Significance: Program Areas to Be Tightened Up"]

[Text] Cologne, 23 Dec 87—For the future, the German Aerospace Research and Testing Institute e.V. [DFVLR] in Cologne-Porz intends to divide its activities strictly into the program areas of aviation, space technology and energetics. Up to now, the yearly budget of around DM 500 million has been distributed with 50 percent going into space technology, 40 percent into aviation and 10 percent into energetics. The budget is comprised of DM 150 million in private revenue and DM 350 million in

public subsidies (primarily from the Federal Ministry for Research and Technology). This money essentially goes into work on the preliminary stage of industrial development.

According to board chairman Prof Dr Walter Kroell, DFVLR wants to contribute to concentrating available national resources in a sort of concerted campaign involving the state, business and science. Each involved party should make the specific contribution that is befitting of him, in order to form long and stable chains extending from fundamental research to industrial application.

Kroell feels that one special feature of DFVLR is the link between research and the performance of services, the later in particular through the use of large-scale experimental equipment and operational facilities. For example, a twin-shaft multistage compressor test stand and the "Cologne cryo-tunnel" were recently put into operation in Porz. The space center in Oberpfaffenhofen controls the positioning maneuvers for the TV-SAT live-transmission television satellite.

DFVLR has nearly 4,100 employees. At present, around 250 of them are working on projects that are to be eventually taken over by the planned "German Space Agency" (DARA). In the opinion of Minister of Research and Technology Heinz Riesenhuber, DFVLR will continue to have considerable work to do even after the establishment of a management organization concerned strictly with space. Riesenhuber considers DFVLR "the" national large-scale aerospace research facility in the FRG.

Prof Kroell warns against budget cuts: "If space projects extending far into the future are being defined on a national basis and large sums of money are being allocated to this, the foundation of research and technological development should not be cut back at the same time." Handling additional responsibilities with reduced funding is "simply too much to ask," he says, adding that it is incontestably part of the purpose of DFVLR to clarify research and technology problems of future carriers and spacecraft, such as Hermes, Columbus and Saenger.

12271

AUTOMOTIVE INDUSTRY

Eureka "Carmat" Program Focuses on New Materials R&D

36980109 Paris INGENIEURS DE L'AUTOMOBILE in French Sep 87 pp40-45

[Article: "New Automotive Materials: The European 'Carmat' Project"]

[Excerpts] The wealth of matters to publish has until now prevented us from presenting to our readers the "Carmat Project" for which PSA is project leader and the main lines of which were communicated to the press on 26 March 1987.

The subject is still of current interest, as this is a long and exacting project, and we shall therefore review it today.

1. Peugeot Unveils the Project

On 26 March 1987, in the prestigious setting of the ACF [French Automobile Club], place de la Concorde in Paris, the project was presented to us during a working session chaired by Mr Jacques Fleury, head of the Peugeot automobile division.

The European partners associated to the project were present at the meeting, which was also attended by representatives of French and foreign administrations. Mr Franois de Charentenay, of Peugeot's directorate of research and scientific affairs, and the French and European partners described the main orientations of the Carmat project.

The participants were then received at the La Garenne research center by Mr Michel Durin, Peugeot technical director, and Mr Jean-Jacques Lanfranchini gave them a guided tour of the facilities of the plastics and composites department.

As is known, on 30 June 1986 in London, the European ministers granted Eureka status to the Carmat project, a label that is synonymous with high-technology research at European level.

1.1 The Objective

The objective of this ambitious project is to design and develop a vehicle that would make considerable use of the new advanced-technology materials now available to the industry.

The project involves more particularly the car body.

The end goal is not to develop an experimental vehicle as "just another exercise in design," but to use prototype vehicles to propose technical and economic solutions that could be implemented on an industrial scale.

With this in mind, a few priority objectives of the project can be identified:

a. to increase vehicle service life, in particular to achieve very- long-term resistance to corrosion;

b. to increase product quality in every respect, in particular to improve acoustic comfort;

c. to make design evolution easier in order to achieve greater vehicle customization and to permit more frequent changes;

d. to decrease production costs by allowing extensive assembly line automation;

e. to enhance passenger safety.

To achieve the objectives of this project, a new structural design must be defined.

The current structure of a vehicle is based on an integral spot-welded body fulfilling a number of functions on the end vehicle: mechanical stiffness of the assembly; resistance to deformation of the passenger compartment; energy absorption (front and rear); styling, i.e. geometrical shape and external appearance.

This structure must also possess certain other properties such as resistance to corrosion. This type of structure, based on the association of mechanical and trim functions in a unitized body, no longer reflects the current evolution. It goes against the trends we have already mentioned: styling flexibility; assembly automation; increased used of new materials.

To overcome this obstacle, we must start with a design in which structural functions are quite distinct from trim functions: a cage- type structure complemented with added semi-structural parts to ensure assembly stiffness and resistance to deformation; external trim parts mounted on the basic structure.

1.2. General Project Schedule

The project consists of two complementary parts carried out in close collaboration:

a. Everything related to the structure as a whole (design, assembly, tests). Peugeot is in charge of this part.

b. The various components of the structure (parts or subassemblies). Each of the partners will be in charge of one or several components or functions of the structure.

The various project steps have been divided into three stages:

Stage I

During this 2-year stage, the parts or subassemblies developed will be adapted to the architecture of existing vehicles ("mules") on which they will be mounted so that actual tests can be performed without requiring a complete structure.

During this stage, a global study based on the possibilities offered by new materials will make it possible to propose an original vehicle design.

Stage II

In this 2-year stage, the data obtained in Stage I will be used to define and develop all the components corresponding to the new structure adopted for the vehicle.

Stage III

This last 1-year stage will see the final completion of the synthesis vehicle or vehicles.

1.3. The Partners' Schedule

The project is divided among the partners, and each part or subassembly constitutes a specific project.

Terms of Participation of the Partners

From the start, the design of a part or subassembly must take into account the material and process to be used. The designer (Peugeot) and the suppliers of materials must therefore work closely together from the beginning of the project, in a true spirit of partnership.

The projects of the partners are summarized below.

Projects of the French Partners

Peugeot

As project leader, Peugeot will: act as architect in charge of the overall vehicle design; define specifications for the partners and cooperate closely in the design of each part; mount the parts on "mules" and test them; assemble the synthesis vehicle(s); perform Stage-III tests; make an analysis of industrial costs based on data supplied by the partners.

Peugeot will also be in charge of developing and testing the processes and assembly components: evaluation, after forming, of the materials to be used for the basic frame (impact, fatigue, corrosion); participation in the evaluation of bonded and assembled structures; development of an injection-compression process for bulk-molding compounds (horizontal parts: hood); process for resin injection into preforms (structural parts); reinforced thermoplastics suitable for stamping.

Usinor-Sollac

These two groups have proposed concerted programs concerning the following points: metallic frame using high-grade sheetmetal with preliminary protective treatment of both sides; front and rear structure extending from the metallic frame (option to be compared with composite or light- alloy structures).

For these structures, the projects will focus on: materials research; shaping, by stamping or profiling; assembly: continuous welding, bonding (in collaboration with CECA [fine chemicals subsidiary of Elf-Aquitaine] and CETIM [Technical Center of the Mechanical Industries]; anticorrosion protection; characterization of the mechanical behavior (fatigue and impact).

Montupet Foundry

This company will study the use of the thin-wall aluminum casting process for part of the front understructure for for the door structure.

These parts will be compared with composite parts.

Vetrotex Saint-Gobain

Forming of reinforcements for resin-injection processes to be used in making structural parts; SMC [sheet-molding] compounds for thin-skins to be used on the car body; participation in the development of an injection-compression process for bulk-molding compounds.

In addition, Vetrotex will contribute to reinforcement optimization, in collaboration with the European partners.

Saint-Gobain Window Panes

Three studies of window panes will be undertaken by Saint-Gobain Window Panes and its European subsidiaries: injection molding to obtain window pane shapes better adapted to aerodynamic and assembly requirements (Spanish subsidiary); development of antifogging window panes (films or surface treatment) (German subsidiary); optimization of window panes to improve air conditioning; absorbent panes to reduce the greenhouse effect; and panes heated by the Joule effect to achieve rapid defrosting.

CETIM

CETIM will carry out a study of all the assembly methods that can be used to develop the structure contemplated. For bonded assemblies, this study will be carried out in cooperation with CECA and Usinor-Sollac.

CECA (Elf Group)

In collaboration with CETIM and Usinor-Sollac, CECA will develop a formulation suitable for the surfaces to be bonded, and a process to remove the bonded joint and assemble the parts.

INRETS [National Institute for Research on Transport and Safety]

During Stages II and III, this organization will study how the new structural concept and the new materials used will affect safety.

Program of the European Partners

BASF (FRG)

BASF will be in charge of the following parts: engine hood with integrated fender in the form of a double structure designed to fulfill stiffness and trim functions—the process is derived from the sheet- molding process; roof with integrated trim, also in the form of a complex structure with a sheet-molded part for external appearance and another material for the outer trim; front support unit integrating numerous connection functions (the process selected should allow for a high proportion of glass and ease of production of complex shapes).

Bayer (FRG)

Bayer will be in charge of the following parts or assemblies: double front floor and connection to the front fire wall; side door structure and trim panels.

DSM (Netherlands)

The parts or assemblies entrusted to DSM are the following: multifunction front end and front bumper assembly (front end to be made of sheet-molding compounds, with the collaboration of Savid, an Italian subsidiary; bumper to be made of modified polypropylene); rear trunk floor and reservoir made of injection blow molded polyethylene; real wheelhouse; rear bumper (polypropylene); study of a "powder-coating" method to protect the metallic frame.

ICI [Imperial Chemical Industries] (United Kingdom)

ICI will design the following parts or assemblies: vertical trim panels (fenders) using a polypropylene sandwich construction; trunk lid (or lift gate) using a sandwich material; doors: inner and outer panels on a metallic structure, with future development leading to a composite structure; fixed side windows (acrylic).

Vegla and Cristaleria Espanola

The projects of these two companies, subsidiary of Saint-Gobain Window Panes, involve studies of antifogging glasses and automobile climate, and will be directed by Saint-Gobain Window Panes.

2. More Details on Peugeot's Approach

The decision to reduce vehicle costs, the reorganization of assembly and post-treatment lines, the wide variety of models and the frequency with which new products are introduced on the market make it necessary to rethink in depth the overall car concept: its shape, styling and manufacturing using both traditional and new materials.

2.1. Basic Materials and Technologies Selected for Body Parts

In the medium term (painting at 140x [sic]) thermoplastic alloys, unsaturated polyester and RRIM [reinforced reaction injection molding] polycarbamide compounds will be increasingly used for vertical components. As for horizontal parts (hood, roof, trunk), it is quite probable that unsaturated polyesters will continue to be used in the 1980's.

The criteria for achieving the best price/performance ratio are still essentially the following: a molding cycle of 1 or 2 minutes maximum, corresponding to the rate at which vehicles are produced in an integrated manufacturing plant; the lack of secondary operations; flexible and modular investments.

Three traditional processes meet these criteria:

a. Thermoplastic Molding

This highly industrialized process still suffers from two economic constraints: the cost of raw materials used to make techno-polymers, and the investments required, which are very heavy compared to the size of the components.

In the short term, process control will be emphasized. In the longer term, the polymers used should be modified in order to reduce their cost, improve their dimensional stability and reduce the viscosity of the melt.

In this field, class "A" materials are selected for stamping; this is still in the development stage, but it would lead to a reduction in molding pressures and promote recycling.

b. Thermosets Molding

Injection (BMC [Bulk Molding Compounds])

The utilization constraints are mostly related to mechanical characteristics and impact resistance. Of all the materials used for body parts, this is the most interesting, because of its cost and its heat resistance, as long as the part is not subjected to excessive impacts.

The improvements considered have to do not only with the formulation but also with the preparation of the compound and its processing, an area in which substantial savings can be expected.

Compression (SMC)

The obstacles to the industrial use of SMC have to do with the process reliability and the variability of production costs. For the "skin" of body parts, it is essential to develop: an in-mold coating formulated according to the vehicle function; full automation of the manufacturing process, from preimpregnation to parts finishing operations; a highly efficient and optimized design of parts and tools, and the development of molds.

And finally: measurement, testing and quality control equipment to be used mainly to evaluate and assess the rheology of the material and the surface condition of the parts; and a statistical process control method. These facilities will make it possible to perfect formulations and the methods used to prepare preimpregnated parts.

Peugeot is now developing a mixed injection-compression process.

c. Reinforced Reaction Injection Molding

RRIM

The limitations of these materials have to do with molding cycle time. Rapid-action self-unmolding amine systems represent a marked improvement.

RIM [reaction injection molding] polycarbamide compounds are serious contenders because of their heat and self-unmolding characteristics and their molding cycle of about 1 minute.

RTM [Resin Transfer Molding]

For structural parts, the RTM process is the counterpart of the low- pressure RIM process; it uses various resins, including polyesters, epoxy and acrylamates.

2.2. New Materials Formulations and New Equipment

This rapid review of materials and processes shows that product design is increasingly material-oriented, so that it is essential that the problem to be solved should be clearly defined from the start by a description listing constraints in order of importance.

In this respect, the Peugeot group has focused its efforts on:

a. the development and improvement of materials and formulations better adapted to the overall situation and to the car production function, using adequate analysis and testing equipment;

b. the construction and implementation of the data processing facilities required for efficient industrialization and quality control, including an expert database and a CAD/CAM system with a statistical molding-process control leading eventually to a servo-controlled machine equipped with its own programmable controller;

c. the measurement methods and equipment required at each stage of the manufacturing process;

d. the development and integration, in the pilot plant of the technical center, of equipment that would make it possible to carry out complete tests on new materials and processes, on a preseries production scale.

Recent developments in vehicle parts other than the body show in particular that application to the automobile is technically valid and realistic and that the cost is very often prohibitive even for the simplest functions.

Therefore, the development of new automotive products seems warranted, as does associating the strong points of certain families of materials and certain processing methods in order to combine their benefits. Simultaneously, the direct preparation of semi-finished products and the formulation of specific compounds for certain processing methods, in particular injection molding, are the subject of research.

2.3. Peugeot Pilot Plants

The initial investment covers a 900-ton horizontal press with a modular multifunction design (equipped with a data entry system designed by Peugeot). The press can be outfitted with two interchangeable 90x- injection units, respectively for thermosets and thermoplastics. It is also equipped with an RRIM molding head on the fixed-plate side. This first machine was complemented by a more sophisticated Peugeot project, viz. a modular multifunction processing unit which also includes:

a. A vertical hydraulic-control closing unit with a clamping force of 1,500 tons; it can lock the press tool in a fully parallel position thanks to a real-time computer which controls and programs speed and pressure, enters data, etc. This first "Muler" unit was placed into service in 1986.

Thanks to the software and speed potential of this equipment, already in 1986 it was possible to complete all the cycles of operations as diversified as the stamping of thermoplastics, the compression and in- mold coating of SMC, BMC and DMC [dough molding compounds] thermosets, and resin transfer molding (RTM).

b. A combined thermoset (BMC)-thermoplastic injection system providing for simple replacement of the worm screw/hopper or worm screw/loading system assembly. The system is fully equipped with a hydraulic control and includes an elevator function to adapt it to the thickness of the mold.

The unit (which will be placed into service early in 1988) will thus be suitable for a number of material/process combinations.

This system was developed jointly with the Bucher company.

c. An RRIM injection system for reactive compounds, which could also be used in combination with the above injection unit in order to provide mixed products with specific characteristics. Used alone, it makes it possible to implement the RIM or RTM processes (high-performance compounds) to make structural parts.

This flexible processing unit can produce all the body parts of a vehicle using all the materials and technologies potentially known or already in industrial use. In particular, it makes it possible to assess more accurately the feasibility of a given production and to look for the best possible combinations in order to achieve the ultimate objective: cost/quality.

It was difficult to manufacture this efficient tool at subcontractors' plants, and it is probable that only part of its flexibility will be used in a production plant.

In addition to its economic and technical importance as far as development and preparation of the future are concerned, this tool can also be used to train more rapidly and more efficiently the personnel who will use plastics and composites, and also to change attitudes toward these materials.

9294

COMPUTERS

Nixdorf, Meitner Join to Conduct Expert System R&D

36980104 Duesseldorf HANDELSBLATT in German 17 Dec 87 p 12

[Article by as: "Nixdorf AG: Agreement on Research Cooperation with Hahn-Meitner Institute, Berlin. Testing Knowledge-Based Systems"]

[Excerpts] HANDELSBLATT, Wednesday, 16 Dec 87; Berlin—Nixdorf Computer AG, Paderborn, and the Hahn-Meitner Institute [HMI] in Berlin have agreed to cooperate on research in artificial intelligence.

The goal of the cooperation will be to lay the technical groundwork for using knowledge-based systems, so-called expert systems, to manage real-time processes.

The joint Nixdorf-HMI project will develop an expert system to be known as "Soleil" to operate production facilities for the manufacture of solar cells from amorphous silicon. It is hoped that this computer-managed system will hold production costs down while still ensuring high product quality.

HMI's goal in this project is to raise quality standards in solar cell production by using expert systems under real-time conditions. The cooperation is important for Nixdorf, which hopes to acquire additional expertise in developing and implementing real-time expert systems in process management, a major element in computer-supported integrated manufacture (CIM).

12593

FACTORY AUTOMATION, ROBOTICS

Italy's Mandelli, IBM Form 'Spring' for Factory Automation

36980115 Milan RIVISTA DIMECCANICAinItalianOct 87 p 97

[Article: "Joint Venture Established"]

[Text] IBM Italia and Mandelli announced the establishment of a joint company owned 51 percent by Mandelli and 49 percent by IBM Italia which will operate in the factory automation sector. The new company, called SPRING (Studies and Projects for Automatic Factory Engineering), will act as a technological center engaged in applied research activities for the builders of production machinery and equipment. The ever more complex technologies employed here as a matter of fact present growing integration difficulties which call for sophisticated, multidisciplinary skills which today are rarely available in the small and medium enterprises.

SPRING, which includes other initiatives undertaken by IBM and Mandelli in the factory automation area, will thus be able, on the basis of the most advanced technologies, to supply prototypes, models, and projects for the various builders to raise both the automation level and the degree of integration of the equipment produced by them. For example, it will be possible to ask for a blueprint to innovate a product through the integration of advanced technological instruments, such as individual tactile and vision devices and for sound processing. In this area it has furthermore been provided that the new company is to participate in research programs promoted by domestic government agencies and by the European Community.

The new company will be operational by October and will, at full speed, have an overall force of about 100 employees, partly coming from the two stockholder companies. The research division will be organized in working groups set up as a function of the particular order that was obtained for a period of time confined to the completion of the project.

This initiative, resulting from experience gathered by Mandelli in the flexible automation field and by IBM Italia in informatics, is aimed at the production process automation market which includes the builders of machine tools, robots, measurement and inspection instruments, robotized warehouses, fand movement systems. In particular, the machine tool sector, which comprises about 500 enterprises with almost 29,000 personnel, had a billing volume of about 2,500 billion lire in 1986.

05058

MICROELECTRONICS

Analysis of Expansion Plans at France's Thomson; Gomez Comment

36980092 Munich INDUSTRIEMAGAZIN in German Sep 87 pp 59-67

[Article: "Arming for the War in the World Market"; first paragraph is INDUSTRIEMAGAZIN introduction]

[Excerpts] Thomson. The French electronics group is making another effort to straighten out its loss-making chip business and entertainment electronics sector. Still the German problem children Nordmende, Saba, and Telefunken continue to cause concern.

How the times change. Today when Alain Gomez talks about the future, he displays unshakeable optimism. "We'll be playing in the major leagues world-wide," is how the 49-year CEO of the French state-owned firm Thomson describes his grand plans for the remainder of the 1980's.

Just 3 years ago he was singing a different tune . "Our main goal," Gomez said then, "is to be among the electronics groups still alive in the 1990's."

Gomez lets himself get carried away like this because after years of heavy losses by the group (sales of DM20 billion, 100,000 employees) which emerged from the nationalization of Thomson-Brandt, 1986 finally closed with considerable profits.

However, last year's positive results cannot conceal the fact that Gomez still has a tough, risky road ahead of him before he has achieved his ambitious goals: for years semiconductors have only produced losses; the consumer electronics subsidiary Thomson Grand Public, with its loss-making German companies Telefunken, Nordmende, and Saba, continues to wrestle with stubborn structural and management problems.

Former left-wing Socialist and paratroop officer Gomez, who left the Saint Gobain conglomerate 5 years ago to become head of Thomson, hopes to eliminate these dangerous weaknesses through an aggressive strategy of expansion and thus win a better position for Thomson on the world market.

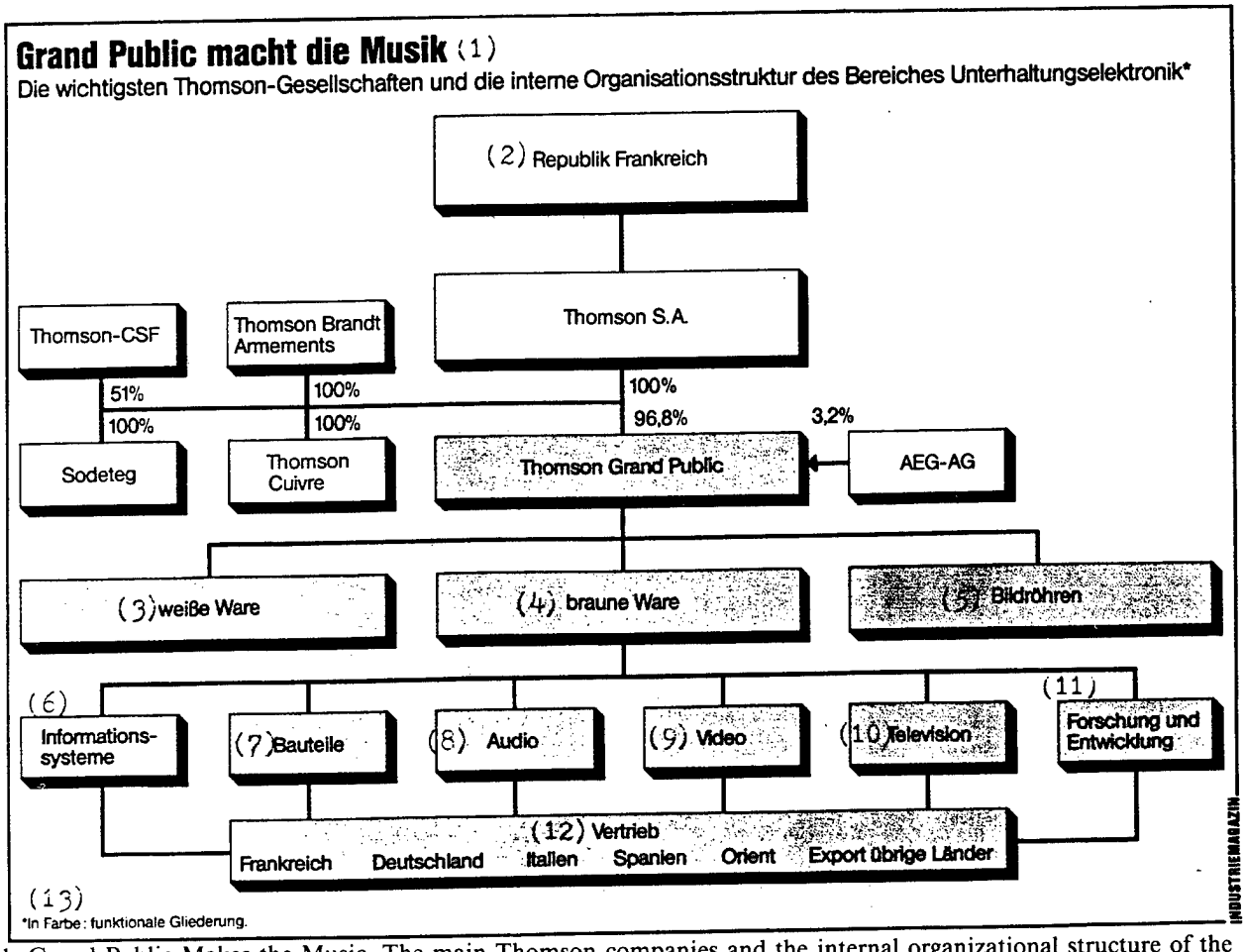
At the same time he is trying to cut costs through rigorous job-elimination and rationalization and to create more synergism in the future by standardizing production internationally.

Gomez has already taken the first steps in this direction with the purchase of television manufacturer Ferguson from Britain's Thorn-EMI plc. and the takeover of entertainment electronics company RCA Corp. from America's General Electric Co. Gomez expects these acquisitions to make Thomson a major player in the industry world-wide.

In May of this year Gomez reached agreement on a joint venture in the semiconductor sector with Italy's SGS Microelettronica SpA, which is part of the IRI state industrial holding company. This assures Gomez's company 12th place among world producers. In Europe the new microchip firm actually moves into second place behind Philips and ahead of competitor Siemens.

Still, some of these expansion moves bear an embarrassing similarity to mistakes of the past which are still hurting the firm. In acquiring Ferguson, for instance, bought extra growth," the graduate of the Harvard Business School and France's elite ENA admitted self-critically just a year ago. "In the end you find you have too many plants, too many people, and too many product lines."

Gomez has good reason not to want to remember. He needs a quick success to spruce the company up for reprivatization since Thomson is on the list of state firms due to be sold. According to current government plans, the public share offering is expected in 2 years.



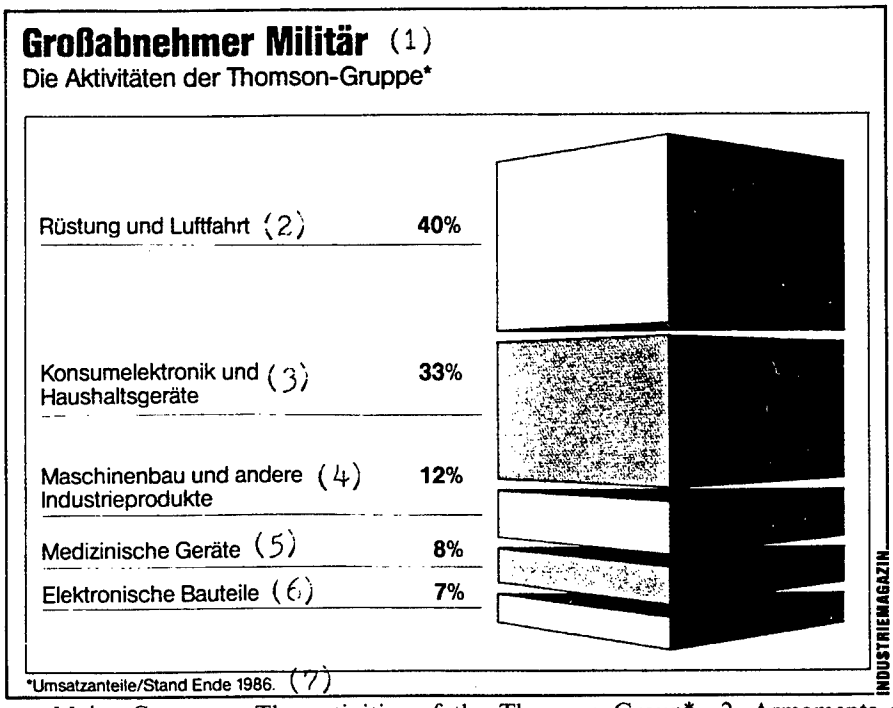
1. Grand Public Makes the Music. The main Thomson companies and the internal organizational structure of the entertainment electronics division*—2. French Republic—3. White goods—4. Brown goods—5. Picture tubes—6. Information systems—7. Building parts—8. Audio—9. Video—10. Television—11. Research and development—12. Sales: France, Germany, Italy, Spain, Orient, Export to other countries—13. *In color: organization by function

Gomez and the new boss of Grand Public, Pierre Garcin (59), have gotten themselves another basket case. And at a time when Thomson is still far from having digested the bankrupt German companies. Also, the chip partnership will first have to eliminate its own losses and cope in the market with price wars and Japanese suppliers.

Nonetheless Gomez has clearly repressed the insights he seemed to have gained just a short time ago. "We always

By then Thomson Grand Public boss Garcin in particular must put his entertainment electronics division (1986 sales of Fr20 billion) into order. He took over in the fall of last year from Jacques Fayard.

The Ferguson purchase—at a net book value of 90 million pounds—is supposed to provide an opening into the British market and thus "consolidate our second place position behind Philips," according to Garcin.



1. The Military—a Major Customer. The activities of the Thomson Group*—2. Armaments and aviation—3. Consumer electronics and household appliances—4. Engineering and other industrial products—5. Medical equipment—6. Electronic building parts—7. *As percentage of sales/End of 1986

The British TV manufacturer will boost the division's sales by DM1 billion. In the main product line, color television, Garcin will be able to add another 700,000 units to total group production of 2.8 million sets. "That gives us a very strong position in the industry," says the consumer electronics boss.

However, Garcin needs the additional European capacity mainly for his central picture tube plant in Anagni (Italy), where the assembly lines operate under capacity.

Still, apart from the brand names, Garcin will not derive much profit from the Fergu son acquisition because the television manufacturer has been in the red for years. Overcapacity and an unfavorable cost and production structure have caused the British entertainment electronics firm to drop far back in the market behind Philips-/Grundig and the Japanese competition.

In the light of experience with the German companies, however, it seems rather doubtful whether the new acquisition will produce the hoped-for cost advantages for Grand Public, even after reorganization.

So far, at any rate, the company bosses in Paris have paid dearly for their German subsidiary Deutsche AG fuer Unterhaltungselectronic OHG (Dagfu), with the brands Dual, Saba, Nordmende, and Telefunken, In 1986 alone Dagfu lost around DM50 million on sales of DM2.8 billion—even though the Thomson entertainment division as a whole made a profit of Fr850 million last year.

Two Thomson managers, Manfred Zemitzsch and Peter Ballerscheff, from the Dagfu subsidiary Electronic Werke Deutschland GmbH are trying to keep the former Nordmende plant open producing plastic parts. Their receiver firm is named Eurotec GmbH and Thomson owns a 24.5 percent interest in it.

Garcin, however, wants to achieve even greater savings. Of course the Grand Public boss assures that "at present we're not planning any major restructuring in Germany." But internally he has already pointed at the plant in Hanover as a possible rationalization target. One of the two production plants in Villingen and Celle would be a possible victim in the medium term.

Pushing to eliminate unused production capacity and concentrate on a few production strongpoints is Garcin's goal throughout the entire group. In the past only the central picture tube factory in Anagni has achieved an optimal plant size. Otherwise, production facilities in France, Spain, Germany, and—because of Ferguson—Britain have been fragmented.

After the reorganization the Grand Public boss wants to produce only large-screen televisions in Europe, because of the high transport costs. Garcin is now having all other entertainment electronics equipment assembled in Thomson-owned plants in the Far East (exception: videorecorders manufactured in a joint venture with JVC in Berlin). His reasoning: "Hi-fi, audio, and small TV sets can no longer be produced in Europe at acceptable costs."

Despite state subsidies of more than Fr3 billion, Gomez continues to suffer heavy losses in semiconductors. Last year alone CSF's semiconductor subsidiary, Thomson Semiconducteurs, lost $30 million on sales of $430 million, according to industry estimates.

Even so Gomez will not get out of chip production because he is afraid of being dependent on foreign producers (see also the interview on page 66). He is supported in this by the French Government, which for military reasons also wants to see the Thomson-CSF military electronics firm continue to have its own chips.

The joint venture with Italy's SGS will be out of the red ink in 2 years, Gomez hopes. He argues that the new firm (working name: Unisem) under designated boss Pasquale Pistorio could reach what Gomez and Pistorio consider the "critical mass," a minimum of $1 billion in sales world-wide (current sales together: $800 million) .

Still, Pistorio has to operate in a market suffering from sharp price cuts and heavy Japanese competition. According to the estimate of a German Thomson/SGS distributor, "50-70 percent" of their production is in the mass goods category where the ruinous price wars are especially violent.

Thomson and SGS, which is also a loss-maker, face particular problems because they lag behind the Japanese suppliers technologically. Due to a lack of know-how in its own microchip plants in Aix-en-Provence and Maxeville (France), for instance, Thomson had to fall back on production technology from Japan's Oki.

And Thomson/SGS have announced their own 4-megabit memory chip for 1989—the Japanese have already presented samples of this type.

First of all, though, the two allied chip producers will be arguing about who will bear the brunt of rationalization. According to preliminary calculations, at least 20 percent of the roughly 18,000 employees and several of the more than a dozen production facilities are superfluous. Even so, the Thomson boss waltzes around such worries with his usual optimism. Gomez: "In the semiconductor sector we'll be among the survivors."

[Box, pp 66-67]

[Interview with Thomson's Alain Gomez: "Don't Count Us Out"; date, place, and occasion not given; first paragraph is INDUSTRIEMAGAZIN introduction]

INDUSTRIEMAGAZIN spoke with Alain Gomez, head of France's Thomson electronics group, about his new company strategy, his plans in the chip market, and the future of the German TV brands.

INDUSTRIEMAGAZIN: Mr Gomez, you've really gone to town with your joint venture with SGS in the semiconductor sector and the purchase of the British television producer Ferguson and the RCA consumer electronics division. Is Thomson large enough now for your taste?

Gomez: The size is better now. In the semiconductor market, for instance, we're now number 2 behind P hilips. Our goal is to achieve a solid position in the world market. Either alone or through cooperation. That doesn't necessarily mean number 1 or number 2. Naturally it can also be number 7 or number 10.

INDUSTRIEMAGAZIN: Do you want to be about as large as Philips and Siemens?

Gomez: Of course not. To put it in a word, I would say that we're the little brother who wants to be more like the bigger brothers.

INDUSTRIEMAGAZIN: What do these new activities bring you besides additional problems?

Gomez: In semiconductors our goal was a world market share of 3 percent by 1990. We reached this goal at less cost and risk by cooperating with SGS. The purchase of Ferguson is in line with the growth of our entertainment electronics subsidiary Thomson Grand Public. With RCA, Grand Public can become a real world organization in this combination. It gains access to research facilities and plants in the United States, Europe, and Southeast Asia—a prerequisite to compete successfully in the rapidly changing consumer electronics market.

INDUSTRIEMAGAZIN: So your strategy is very simply one of "strength through size"? Gomez: We have our four main sectors: military electronics, entertainment electronics, medical equipment, and electronic components. As far as size and market share go, only one of these is in a good position—military electronics. So our strategy will be to hold on to that division and boost all the others into a more satisfactory position or give them up, as we did with our medical technology company Thomson-CGR. And in the next 5 years we also want to expand the financial services sector because that made a very large contribution to the company's results.

INDUSTRIEMAGAZIN: Thomson boss Gomez as a banker in the future, then?

Gomez: I wouldn't say a banker, a financier rather.

INDUSTRIEMAGAZIN: Is just buying market share enough to be able to stay afloat in future competition?

Gomez: Market share cannot replace R&D and good management. Size alone is not enough but it's a prerequisite. Profit comes from competitiveness. And competitiveness is very closely connected with world market share and size.

INDUSTRIEMAGAZIN: In the past that calculation didn't always work.

Gomez: In the 1970's Thomson's situation was worsened by two significant mistakes. One was strategic, the decision to diversify into the civilian communications business. We didn't need another business, we already had too many. To this mistake we added management errors. Because of management errors we had heavy losses in many parts of the group. In 10 years we lost Fr10 billion in the telecommunications adventure and other loss centers. What I've done since I came to Thomson in 1982 was to fix these weaknesses and mistakes.

INDUSTRIEMAGAZIN: Do you want to sell your consumer electronics division as a result?

Gomez: We never decided that.

INDUSTRIEMAGAZIN: And Saba, Nordmende, and Telefunken, will they stay in Thomson?

Gomez: Of course they will. I really don't understand some comments in the German press about what we're doing in Germany. A few facts on the matter: all those German firms were either bankrupt or bought up by Philips or Thomson. We feel that it's better for Germany for the companies to have been integrated into the Thomson group than for them simply to have disappeared. That's life. You can't win them all.

INDUSTRIEMAGAZIN: Right now you're pulling out of the German production facilities.

Gomez: Today we have two legs in entertainment electronics: France and Germany. We sell no less in Germany than in France. Germany is vital for us. If we didn't have a presence in Germany, we wouldn't exist any more. There's no question whether we'll stay in Germany. Don't forget that total costs for a worker in Singapore are 7 times less than in France or Germany. So our competitiveness is at risk. The only way to retain our competitiveness is through concentration with optimal plant size.

INDUSTRIEMAGAZIN: Does Thomson need to produce semiconductors itself?

Gomez: It would be very unwise as a large electronics firm not to try to retain control and production in semiconductor technology. I'm very well aware of the risks, costs, and challenges. I feel we've got to do it. And don't count us out till we're out.

INDUSTRIEMAGAZIN: Where are you getting the money to keep up in the chip business?

Gomez: We and SGS have a budget of about $200 million. If we're not too stupid, that ought to be enough to get going. Besides, we have firm commitments from the Italian and French Governments to help us. Just as they help SGS and Thomson alone.

INDUSTRIEMAGAZIN: What are the figures?

Gomez: The contributions from the Italian and French Governments will be around $50 million each for 1987. I think that's less than the German Government gives Philips and Siemens.

INDUSTRIEMAGAZIN: When will you finally make money from chips? So far you've only produced losses.

Gomez: Naturally we've got losses. And we'll have losses in 1987. We hope to reach the profit zone between 1988 and 1989.

INDUSTRIEMAGAZIN: Does that mean that if you're in the red in 1989, the company shuts down?

Gomez: I can't imagine that we'll have losses in 1989. That isn't in our plan.

INDUSTRIEMAGAZIN: Recently the Japanese presented the chips of the generation after next. In light of their lead aren't you afraid of not being able to keep up?

Gomez: Of course we're afraid. But being afraid doesn't mean running away or standing there paralyzed. Fear must lead to positive action.

INDUSTRIEMAGAZIN: And if the joint venture isn't operating at a profit by 1989, will Alain Gomez be staying on as head of Thomson?

Gomez: A lot of things would have cost me my head if they hadn't worked out. Those are the rules. And I accept them.

12593

SCIENCE & TECHNOLOGY POLICY

1988 EEC High Technology Programs Report

36980049 [Place not given] EUROTECH FORUM JOURNAL in English Dec 87 pp 1-53

[Excerpts]

Introduction

Technological progress is the key to the future—a prerequisite for the success of the large market and the way to gain control of our destiny. Europe's high technology drive has set the Community on a definite course: no single Community country possesses all the researchers in the various scientific fields nor adequate financial resources; however, together, the Community countries

have the know-how and the necessary means. Community Member States have always been in the forefront of research and technology but the speeding up of technological progress has made it imperative for decisive and coordinated action. Computer technology, telecommunications, new materials, energy and biotechnology are some of the areas covered by the Community programmes and substantial achievements have already been made.

The Community's research policy is implemented through programmes which cover many scientific and technical fields. These programmes are launched where Community action seems more suitable, more effective, or more timely than any other national or multilateral activity. Impressive results from the 201 projects in the ESPRIT (European Strategic Programme in Information Technology) programme, though launched only 4 years ago, have already been achieved. In microelectronics, the development of gallium arsenide components for the next generation supercomputers, as well as a new method for designing complex and more reliable chips for compact disc-players, are noteworthy. In 'expert systems', two high-performance systems were developed in the framework of the Omega project of which the United States had a monopoly till recently. Under the Herode project, in the field of integrated office systems, a new standard was drawn up for composite electronic documentation (voice, text and image), in which a number of European firms are involved. Under a European "stimulation" initiative, eight laboratories in five member countries (United Kingdom, Germany, France, Belgium, Italy) have developed digital circuits and other elements for a future optical computer. The RACE programme, organized on the ESPRIT model, is a strategy to help Europe maintain its lead in the Telecommunications arena: the future European broadband network will be a veritable highway for new means of communication. Four industrial laboratories belonging to leading automobile and aerospace firms (in the United Kingdom, France, Germany and Italy) have joined together under the BRITE programme to develop a laser for sheet welding. In Materials, under a stimulation initiative and the Euram (new materials) programme, 40 European laboratories have linked up to develop permanent supermagnets based on an alloy of iron, neodymium and boron; the purpose of these supermagnets is to replace electromagnets in numerous applications.

Financing

The Commission's financial contribution to research projects is expressed in European currency units. The value of the European currency unit, the ECU, is determined on the basis of a "basket" of the currencies of the 12 Member States and is calculated daily on the basis of the rates on the foreign exchange markets.

The Framework Programme is a detailed blueprint for European high-technology cooperation necessary to give European industry an internationally competitive position on the open markets of the 1990s. Information and communications technologies—and notably the second phase of ESPRIT—are key components of the Framework programme, which was approved by the Council of Ministers in July 1987. The Framework programme is central to the future competitiveness of European High Technology, on the single community market and on the world markets of the 1990s.

The Community's budget includes a number of funds, such as the Social Fund and the Regional Development Fund, which promote Community objectives by financing suitable projects. Finance is also available from specialising community institutions such as the European Investment Bank. Community finance normally takes the form of grants, low-interest loans or participation in contracts funded by the Community. Regulations govern the operations of the funds and these ensure that Community finance is directed effectively; these regulations are frequently reviewed and adjusted according to the changing Community objectives and policies. The amounts to be distributed by each fund have to be voted by the member states every year, so that cash available is subject to constant change.

EUROPEAN VENTURE CAPITAL ASSOCIATION (EVCA)

An international scientific association formed in 1919 and amended in 1954 under the new name European Venture Capital Association.

Objectives:

—Develop and maintain a venture capital industry so as to provide equity finance for innovation and small and medium sized enterprises

—Establish high standards of business conduct and professional competence

—Stimulate the promotion, research and analysis of venture capital in Europe as well as in other territories

—Facilitate contact with policy-makers, research institutions, universities, trade associations

—Encourage the formation, development and use of equity markets appropriate to the needs of venture capital investors

—Organise symposia and seminars

The growth of the European venture capital industry continued last year with a 39 percent increase to 10 billion ECU in the amount of funds available for investment in unquoted companies. The venture capital industry in the European Community is now nearly half as big as in the United States. 1987 has seen a record amount of venture capital fund raising with unprecedented amounts being earmarked for management buyouts. While half of all venture capital investments are made by

syndicates, a recent survey reveals a significant expansion in transnational syndication. Stimulated by the European Community's Venture consort scheme, syndication of investments between European partners has expanded quite significantly. Pan-European syndication offers the advantage of providing fast-growing companies with an international base of venture capital investors who can assist in penetrating new markets. Further Information

Contact:

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Tel. 5137439.

COMMUNITY'S FRAMEWORK PROGRAMME
1987-1991 PROGRAMME million .....ECU

1. Quality of life 375

1.1 Health 80

1.2 Radiation protection 34

1.3 Environment 261

2. Towards a large market and an information and communications society 2,275

2.1 Information technologies 1,600

2.2 Telecommunications 550

2.3 New services of common interest (including transport) 125

3. Modernization of industrial sectors 845

3.1 Science and technology for manufacturing industry 400

3.2 Science and technology for advanced materials .220

3.3 Raw materials and recycling 45

3.4 Technical standards, measurement methods and reference materials 180

4. Exploitation and optimum use of biological resources 280

4.1 Biotechnology 120

4.2 Agro-industrial technologies 105

4.3 Competitiveness of agricultural and management of agricultural resources 55

5. Energy 1,173

5.1 Fission: nuclear safety 440

5.2 Controlled thermonuclear fission 611

5.3 Non-nuclear energies and rational use of energies 122

6. Science and technology for development80

7. Exploitation of the seabed and use of marine resources 80

7.1 Marine science and technology 50

7.2 Fisheries 30

8. Improvement of European Stimulation cooperation 288

8.1 Stimulation, enhancement and use of human resources 180

8.2 Use of major installations 30

8.3 Forecasting and assessment and other back-up measures (including statistics) 23

8.4 Dissemination and utilisation of S/T research results 55

Total 5,396

COMMUNITY'S RESEARCH AND DEVELOPMENT PROGRAMMES

INFORMATION TECHNOLOGY

Information technology has become a determining factor in industrial competitiveness and has become one of the fastest growing economic sectors. By the end of the century, IT will be the most important manufacturing sector in the world economy.

ESPRIT (EUROPEAN STRATEGIC PROGRAMME FOR RESEARCH AND DEVELOPMENT IN INFORMATION TECHNOLOGY)

Programme Duration

Phase 1 (1984-88)

Phase 2 (1988-92).

Budget

Phase 1 750 MECU. (Community's contribution)

Phase 2 1600 MECU. (Community's contribution)

Objectives

Equip the European information technology industry with the basic technologies to meet the competitive requirements of the 1990s; promote European industrial cooperation in information technology; contribute to the development of internationally recognised standards. A further aim of ESPRIT is to make up lost ground, particularly in relation to the United States and Japan, as a result of the Community's earlier dependence in these areas on imported technologies.

Key Areas and Programme Structure

The programme is divided into 5 main areas:

—Microelectronics

—Software Technology

—Advanced Information Processing

—Office Systems

—Computer Integrated Manufacturing

The first three of these are mainly directed at more fundamental levels of precompetitive research, while the last two areas are aimed at application research. As part of the ESPRIT structure, the Information Exchange System (IES), has been created to enable all participants to have regular access to documentary information about the programme as well as communicate with other participants. IES consists of three databases and a packet switching network.

The three databases are:

—SCD 1 for information about IT projects (ESPRIT, RACE, COST-11,DOC-DEL,ALVEY (UK), COST-13, Microelectronic technology, BRITE,MAP/ ADA and COST-2XX)

—SCD 2 for information about research and development facilities and sites

—SCD 3 for information about Electronic Mail.

All these databases can be reached via ECHO-HOST in Luxemburg.

There were 226 projects in operation in phase 1, whilst Phase 2, the "technology integration project," will function closer to the market.

Like the first phase, ESPRIT 2 is divided into various sectors:

—microelectronics,

—information processing systems,

—IT

—Application Technologies.

Future Plans

Fundamental research work in selected areas of long lead-time, complementing the proposed precompetitive IT research and development efforts will be sponsored. It will be possible for companies outside the Community (Switzerland, Austria, and the Scandinavian countries) to participate in ESPRIT 2 projects.

Further Information:

Directorate for IT and ESPRIT
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Telecommunications

RACE (RESEARCH AND DEVELOPMENT IN ADVANCED COMMUNICATIONS FOR EUROPE)

Programme Duration

Definition Phase: 1985-86.

Main Phase: 1987-91.

Budget: 550 MECU

IBC DEVELOPMENT AND IMPLEMENTATION STRATEGIES 60

1.1 IBC Strategies 14

1.2 IBC Realisation (System Analysis and Functional Specification) 28

1.3 IBC Usage 10

1.4 Common operational environment 8

IBC TECHNOLOGIES 332

2.1 Techniques for IBC Systems Functions 94

2.2 IBC Programming Infrastructure 49

2.3 Usability Engineering 12

2.4 Technologies Enabling Network Evolution 177

PRENORMATIVE FUNCTIONAL INTEGRATION 113

3.1 Verification Tools 63

3.2 Development of IBC Application Pilot Schemes..50

Personnel Costs 25

Administrative Costs.....20

Total 550

Objectives:

Introduction of Integrated Broadband Communications (IBC) based on the evolving integrated service digital networks (ISDN) and national introduction strategies, advancing to Community-wide services in 1995 by cooperative research and development. The specific aim being to ensure that the various telecommunication services and systems being developed in Europe remain coherent. This type of system would incorporate a very wide range of new and traditional services, including telephones, videophones, cable and pay television, data transmission, and electronic mail.

KEY AREAS AND PROGRAMME STRUCTURE:

The programme is structured into 3 parts:

—IBC development and implementation strategies:

these will comprise work required for the development of functional specifications, systems and operations research towards the definition of proposals for Open Systems-conforming standards, concepts and conventions and analytical work serving the objective of establishing interoperability for IBC equipment and services. This work is to be carried out by appropriate organisations, groups and other bodies including, where necessary, contract work.

—1) IBC TECHNOLOGIES, will comprise R&D cooperation in IBC Technologies at the precompetitive stage

—PRENORMATIVE FUNCTIONAL INTEGRATION, will comprise prenormative and precompetitive R&D relating to cooperation in the realisation of an "open verification environment" designed to assess functions, operational concepts and experimental equipment proposals arising from work in 1).

Research projects will cover the following technology sectors:

—high-speed integrated circuits;

—highly complex integrated circuits;

—integrated opto-electronics;

—broadband communications (indispensable for videophony);

—passive components for optical links;

—high-speed processing components;

—dedicated communications software;

—large-area flat-panel display technology.

Research will also include theoretical work on the evaluation of future broadband communication needs and the development of an IBC network model.

The definition phase is nearing completion and will be followed by the first actual developments, which will equip RACE with the necessary tools, new terminals or other telecommunications equipment. This first part will establish the technological base for the introduction of a Community-wide integrated broadband communication network, will develop the equipment, and will support the work carried out by CEPT and CCITT aimed at definition of new standards. By 1991 the first phase is likely to have been completed; the technology necessary and the new telecommunications tools should also be in place; thus paving the way for the final phase (perfecting the network and setting up the demonstration project).

The work will be carried out in the form of transnational cooperation between industry, the PTTs and telecommunications companies and other research centres. The participants will bear 50 percent of the costs and the other half will be borne by the Community budget.

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BIOTECHNOLOGY

Programme Duration

Phase: 1985-89

Budget: 120 MECU

Objectives:

The programme is basically precompetitive, and is oriented towards medium and long term objectives essential for the strategic strength of European industry and agriculture.

It deals with the two following aspects:

—the establishment of a supportive infrastructure for biotechnology research in Europe;

—the elimination, through research and through training, of bottlenecks which prevent the exploitation by industry and agriculture of the materials and methods originating from modern biology.

Areas Covered

Contextual measures

Bioinformatics: the interface between biotechnology and information technology (data capture, data banks, computer assisted design, etc.). Collection of biotic materials (upgrading and integration of existing collections, enhancement of techniques).

Basic technology enzyme engineering: bioreactors of 2nd generation, stability of enzymes, protein design.

Genetic engineering: applied to microorganisms important for industries, to plants and soil micro-organisms, to animal husbandry. Technology of cells cultured in vitro (micro-organisms in continuous cultures, regeneration of plant cells, new methodologies for animal cells.

In vitro tests to screen new molecules created by industry for their biological activity and possible toxicity.

Methods of assessing possible risks associated with modern biotechnology.

Concertation of national and Community policies. A range of information, liaison, evaluation and initiation tasks to ensure that Community policies affecting biotechnology are both relevant and consistent within the Commission, and in relation to the outside world.

Implementation

—Long-duration training contracts available to both junior and senior research scientists involving travel from one community country to another.

—Multiannual marginal-or shared-cost research contracts with public sector or private research bodies.

—Regular meetings, dissemination of information and results, and on-site visits.

As regards European integration and industrial involvement, new selection criteria were defined which are based on the transnationality of the research proposals and on expressions of interest originating from industrial partners.

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INDUSTRIAL TECHNOLOGIES

BRITE (Basic Research in Industrial Technology for Europe)

Phase 1: 1984-87.

Phase 2: 1987-91

Budget:

60 million ECU (Community financing phase 2)

Objectives:

Improvement of European competitiveness in the area of advanced materials technology. The aim of this programme, which follows the same approach as ESPRIT, is to stimulate cooperation between European industries and to promote industrial competitiveness.

Key Areas and Programme Structure:

BRITE has 9 priority themes:

—Reliability and deterioration

—Laser technology

—Joining Techniques

—New Testing methods

—CAD/CAM and mathematical modelling

—Polymers, composites and new materials

—Membrane science and technology

—Catalysis and particle technology

—New production technologies suitable for products made from flexible materials.

Launched in 1985 as a four-year programme to increase the use of advanced technologies in the traditional sectors of industry, the programme has already achieved, after two years a climate of cooperation in industrial technology and has contributed to the establishment of a base for new competitiveness for European companies.

The decision to launch BRITE II, in 1989, has already been taken.

Further information:

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ADVANCED MATERIALS

EURAM (European Research on Advanced Materials).

Programme Duration 1987-90

Budget

30 million ECU (EC contribution)

Objectives:

The main objective of the programme is the creation, synthesis, development and characterization of new materials, or the upgrading of more conventional ones, to a higher level of sophistication at competitive production costs.

Key Areas and Programme Structure

The EURAM research programme covers:

Development of metallic materials:

—Light aluminium, magnesium and titanium-based alloys;

—high-performance magnetic materials;

—electrical and electronic contact materials;

—materials for surface coatings and machine tool cutting equipment;

—thin walled castings.

Development of engineering ceramics:

—Optimization of engineering ceramics;

—metal/ceramic interface;

—composite ceramics;

—high-temperature behaviour of engineering ceramics.

Development of composite materials:

—Organic-matrix composites;

—metallic-matrix composites;

—ceramic-matrix composites;

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SCIENTIFIC FORECASTING: FAST (Forecasting and Assessment in Science and Technology)

Programme Duration:

Phase I- 1978-83.

Phase II- 1984-88.

Phase III-1988-92.

Budget:

8.5 million ECUs

Objectives:

Multidimensional analysis of scientific and technological change in order to identify and suggest new priorities for the Community R&D and the long term Community action. Reinforcement of the European cooperation among research institutions and the centres specialised in the field of forecasting through the creation of Community operation networks.

The research carried out under this programme attempts to analyse the possible and probable scientific and technological trends in a certain number of fields, and tries to identify the socio-economic problems associated with those trends. The major topics of research are the relations between technology, employment and work, the information society, renewable natural resources, strategic and industrial systems, especially the communications and food industries.

Further Information, Contact:

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STIMULATION OF SCIENTIFIC AND TECHNICAL POTENTIAL

Stimulation Action Programme (stimulation of European Cooperation and scientific and technical interchange)

Programme Duration.

Phase: 1983-84 (experimental phase)

1985-88

Budget: 60 MECU.

Objectives:

Promote cross fertilisation inside the Community. The Commission is trying to increase the mobility of researchers, promote cooperation and encourage professional integration of young researchers by a wide ranging action.

(IT project: Basic research in Adaptive Intelligence and Neuro Computing-BRAIN)

Forms of support:

The support available under classical Stimulation Action is of three kinds:

—Research Grants: for personal mobility (so that individual researchers may go from one Member state to join a team in another, contributing their own expertise or developing a specialisation)

—Twinnings: between research teams from at least two different Member States and from the academic or public or private sectors, for meeting costs, travel and accommodation expenses and extra staff and equipment needs

—Operations: with a specific result in view, where a contribution to the costs of existing staff and equipment can be made in addition to help given under twinnings; all fields of the exact and natural sciences can be considered and any type of research from the most basic to the most applied. The involvement of industry is therefore encouraged.

In addition to the normal Stimulation support, two further measures have been proposed:

—participation in large scale facilities such as accelerators, synchrotrons, or oceanographic vessels to enable Community researchers who would not otherwise have access to them, and so that they might be adapted, given special features and/or operated more economically

—career Awards intended to encourage high quality researchers to remain in Europe. Further as part of the establishment of a Researcher's Europe, a range of complementary measures would be instituted with a view to easing the transfer of eg: pension rights, qualifications or scientific equipment.

Further Information:

There are no deadlines under the 1985-88 plan and proposals in all fields of the exact and natural sciences can be considered at any time. It is advisable to apply at least ten weeks in advance of selection meetings.

Contact:

STIMULATION ACTION

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COMETT (Community Action Programme for Education and Training for Technology)

Programme Duration

Approved in 1986

Initial phase 1987-89

Phase 2 1990-92.

Budget

Phase 1: 45 MECU (EC funding-maximum 50 percent)

Objectives:

develop advanced training for new technologies in Europe with particular emphasis on the European dimension and on university-industry cooperation. The main objective is to stimulate and reinforce effective European cooperation between enterprises (business organizations of all types) and universities (all types of higher education institutions).

Directed at enterprises and training institutions, the training projects include:

—training for innovation, development, application and for the management of new technologies;

—training of students, and engineers, technicians and management within companies;

—training of trainers to provide an effective response to technological change; improve the supply of training at local, regional, national and Community levels; design and disseminate advanced training products.

Programme: COMETT consists of four distinct strands:

Strand A Development of University-Enterprise Training Partnerships (UETPs)

Strand B Transnational exchange of students and personnel between Universities and enterprises

Strand C Design and Testing of joint university-enterprise projects in the field of continuing education in new technologies

Strand D Multi media training systems for the new technologies

Under each of the strands, applicants may, as part of the overall funding for the project concerned, obtain the financial support of the European Community. Financial contribution may cover up to 50 percent of the total cost of the project costs (strands A, C and D). For transnational exchanges, a flat-rate contribution per person is made taking into account the nature of the exchange concerned (strand B).

Further Information:

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Non-nuclear energy R and D.

Programme Duration: 1985-88

Budget: 175 million ECUs

Objectives:

Diversify energy supplies entailing increased effort on research and development of technologies for the exploitation of alternative energy sources. The Community energy research programme is intended to further the development of alternative energy options and improve the economic viability so far attained.

Programme:

A) Development of renewable sources of energy

1. Solar Energy

Here an estimated 35.5 million ECU is required to implement the following fields of research in the subprogramme:

—solar energy applications in buildings

—thermomechanical solar power plants

—photovoltaic power generation

—solar radiation data

—solar energy applications in agriculture and the food industry

2. Energy from biomass

An estimated 20 million ECU is necessary for implementation of the subprogramme:

—development and recovery of biomass for energy purposes

—biomass conversion technologies

—utilization of biomass as a source of energy

—photochemical and photobiological processes

3. Wind energy

Around 18 million ECU will be necessary for implementation of this subprogramme:

—assessment of resources in Europe

—wind generator experiments

—development of technologies and prototypes

4. Geothermal energy

21 million ECU will be needed for this subprogramme:

—exploration and assessment of resources

—properties of geothermal reservoirs

—production and management of reservoirs

—utilization and conservation of resources

—hot dry rocks

—training and education

Rational use of energy

5. Energy conservation

An estimated 16.5 million ECU will be needed to implement this subprogramme which covers the following:

—buildings

—industry

—transport

—energy storage

6. Utilization of solid fuels

An estimated 20 million ECU will be necessary for this sub-programme:

—heat and power production

—transport and handling of solid fuels

—solid fuels science

7. Production and utilization of new energy vectors

An estimated 10 million ECU will be needed for this sub-programme:

—production of synthetic fuels from coal

—production of synthetic fuels from biomass

—studies on systems and materials specific to these two production methods

—generation of hydrogen for synthetic fuel production

—fuel cells

8. Optimization of hydrocarbon production and use (15 million ECU will be necessary for this sub-programme)

—improvement in the knowledge of hydrocarbon deposits

—use of natural gas

—use of petroleum heavy fractions

—fuel: engine matching

9. Energy system

Analysis and modelling 16 million ECU is needed for this subprogramme:

—maintenance and utilization of existing models

—development of new models

—application of the model and consolidation of the association infrastructure

The Community's work on non-nuclear energy also includes research performed at the Joint Research Centre's Ispra Establishment. This research concerns methodologies for the testing and assessment of solar energy components and systems (photovoltaic converters and heat traps); and the study of energy management in domestic houses. Work is also being carried out on technical research into coal which explores mining technology and new methods of burning coal.

Further Information

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FUSION

Programme Duration: 1987-91

Budget: 690 million ECU

Objectives:

The ultimate objective is to build fusion reactors for energy generation. The path to be followed can be schematically divided into three stages: demonstration of scientific feasibility, and eventually economic feasibility. At present, JET, the medium-sized tokamaks and their foreign equivalents are still essentially at the scientific stage. The next European Torus (NET), now in the pre-design phase, is conceived at present as a device which should fully confirm the feasibility of fusion in a first phase, and tackle the problem of technological feasibility in a subsequent phase

The main activities for the period aim at:

—establishing the physics and technology basis necessary for the detailed design of NET; this implies the enhancement and full exploitation of JET and of several medium-sized specialized tokamaks in existence or under construction, the extension of the duration of the JET Joint Undertaking up to the end of 1992, and the strengthening of the technology programme;

—embark, possibly in 1989-90, if the necessary data base exists at that time, of the detailed design of NET;

—explore the reactor potential of some alternative lines;

—develop methods for management and safe handling of the quantities of tritium involved in the operation of fusion machines. Construction of a tritium handling lab.

Closely linked with the JET experiments, the fusion programme consists of work on plasma physics and research into fusion reactor technology in other medium-sized facilities. This research is underway in several Community institutions and at the Joint Research Centre. In the medium term, the programme provides for the building of an experimental fusion reactor which is meant to demonstrate the technological feasibility of fusion. The Next European Torus will be one step further to developing a commercial fusion reactor.

Further Information:

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COST (Cooperation in the field of scientific and technical research)

Established in 1971 and comprising 19 European countries, COST includes the 12 member states of the EC and the other 7 European countries (Austria, Finland, Norway, Sweden, Switzerland, Yugoslavia, and Turkey).

Some COST projects are integrated with the research programmes of the EC. For a programme to be started at least three countries are needed. Each country pays its own costs, while coordination is paid for by the Commission; some COST projects are sponsored by the European Commission.

Objectives:

—Coordinate research programmes, either existing or proposed,

—tackle problems which are international in nature,

—show similarities between participating states,

—provide a basis for the harmonisation of regulations at European level.

COST projects have covered the following areas:

Informatics, telecommunications, transport, oceanography, metallurgy and materials, environmental protection, agriculture, food technology, medical research and public health and social sciences.

Further Information:

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EUREKA (European Research Cooperation Agency)

An initiative by France to improve technological cooperation in Europe in order to create a large home market for European companies in the field of advanced technologies. Established in 1985 and comprising 19 European countries (including the 12 EC member states, 6 EFTA member states and Turkey) cooperating on a project base. The European Commission is also a 'member' of EUREKA.

FUNDING: EUREKA operates at a governmental level and the funding of projects depends solely on the firms taking part.

OBJECTIVES

EUREKA is mainly concerned with developing products, processes, services having market potential whereas most projects of the EC are directed at basic or applied research or development.

EUREKA and the EC technology programmes show similarities in the aims pursued namely:

—increasing the ability of Europe, its researchers, and its industrialists to understand and develop advanced technologies,

—promoting transnational cooperation between industrialists and the scientific community through the implementation of joint projects bringing together partners from different European countries which may or may not be members of the Community.

Over a hundred projects are currently being developed in the framework of EUREKA and the cost of these projects exceed 100 million ECU with some of these projects lasting eight years. The Eurotech Forum has issued a Eureka report in July 1987.

Further Information:

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08309

Eureka Project for High-Capacity Fiberoptic Network

55002407 Paris ELECTRONIQUE ACTUALITES in French 18 Sep 87 p 8

[Text] Based on a cooperation agreement signed a year ago, the companies ANT (FRG), GEC (United Kingdom), SAT (France) and Telettra (Italy) presented a research and development project for a single mode fiberoptic transmission system with a 2.5 Gbit/s capacity, which was reviewed by the interministerial Eureka conference held on September 15in Madrid.

Such very high capacity systems are intended to be used in the installation of the future wide band integrated services digital network —wide band ISDN—and will constitute one of the major components of data transmission systems in the coming years.

The technologies required for their implementation will also have a significant impact in other related fields.

The initiation of a Eureka program for implementing the proposed project will provide strong incentives for the four companies.

Work related to this program will be conducted within the context of an existing agreement among these companies designed to optimize the research and development activities and investments of each and their joint participation in strategic European data transmission programs in the field of public telecommunications.

The initiation of European programs for information, technology and telecommunications, the gradual internationalization of telecommunications markets accessible to European industry, the increased investments required to develop new generations of telecommunications systems and attendant vital components represent the major incentives which have led these four companies to work together to jointly develop and utilize their technological potential.

This major agreement emphasizes the four partners' joint efforts to strengthen European industrial capacity in the telecommunications field. The agreement does not implicate the pre-existing obligations and relations of each partner and is designed as a general guideline for future contracts for cooperation on specific issues that may be concluded among the four companies. 12798

Discrepancies Seen in Access to, Participation in Eureka

36980136 Duesseldorf VDI NACHRICHTEN in German 4 Dec 87 p 18

[Article by Joachim Sevenich: "Small and Medium-Sized Enterprises at a Disadvantage in Eureka"; first two paragraphs are VDI NACHRICHTEN introduction]

[Text] Duesseldorf, 4 Dec 87 (VDI-N)—It is principally large firms that are profiting from European technological support. Obtaining information is the greatest hurdle.

Conceived as a flexible framework for European cooperation in technology, Eureka is open to all initiatives from companies and research entities. Although Eureka was tailored to the needs of small and medium-sized enterprises [SME's] as a "bottom-up" initiative, their direct participation falls considerably below expectations.

The reasons for this lack of involvement take various forms. The jungle of paper work is mentioned, as are language barriers between partners. However, most of the problems fall into the category of information acquisition. The sole task of entire departments in large companies must be handled along with everyday work in SME's.

Among the 75 German firms participating in Eureka, some of them in several projects, about 20 are SME's with annual sales under DM200 million.

The reason for this low participation is the miserable channeling of information about cooperative and support programs such as Eureka to SME's. According to Dr Alfred Richmann of the DIHT [German Confederation of Industry and Commerce] in Bonn, details about Eureka, especially about the differences between Eureka and other EC programs, are still inadequately known. Frequently in EC programs an idea is developed at the top and handed down to firms. All that is necessary is to submit 30 to 40 copies of the bid within 8 weeks, in several languages, etc. In contrast, according to Dr Alfred Richmann, Eureka is a bottom-up initiative: The individual firms must organize themselves and unite, must take the initiative and be responsible for technical and contractual progress.

In the area of formal participation, with Eureka a framework has actually been established which can make it easier for innovative firms interested in cooperation to work with European partners. Suitable starting points in the search for partners are professional organizations, the Eureka headquarters in Brussels, or the BMFT [Federal Ministry for Research and Technology] in Bonn. Once a project has been defined with European partners and the common ideas are set down in a cooperation agreement between the partners, nothing stands in the way of the project application in the prescribed form to the competent national coordination offices.

Some people might wonder what the actual advantage is compared to conventional transnational cooperation between business partners. In addition to the prestige value of participation—Eureka justifiably symbolizes leading edge technology in Europe—participation can give significant practical experience to SME's, which have still had little experience in transnational cooperation.

The Search for Partners in Europe Is Difficult Business

A motivational effect among employees and stimulation of long-term planning are conceivable as additional incentives. An important point, especially for SME's, is the bringing together of innovative companies and venture capital which is beginning: Eureka is a virtual stamp of quality and a market for venture capital.

A project must fit into the strategic objectives of a company, warns Dipl.-Eng. Klaus Kallweit of the Aachen IHK [Chamber of Industry and Commerce]. Whether with Eureka or other support programs, project goals must already be clearly defined. He feels that under no circumstances should anyone jump into a project just because there is a support program. He describes the search for partners as "difficult business." After all, Eureka involves confidential cooperation in R&D. He advises, in the search for partners, carefully chosing partners with similar competencies. Partners need not be the same size. Even without support, it would be necessary to plan for the required personnel expenditures because of the required search for partners and subsequent coordination with them. In his experience, apart from the support, Eureka involves relatively little red tape; the expense remains manageable.

However.... Most Eureka projects require outside financing. Either their size is such that it exceeds the financial resources of an individual firm, or processes and products are developed for which, although they are of general interest, only limited markets exist—such as specialized devices for environmental analysis.

Graduate physicist Burkhard Fischer of the Bremen Institute for Operations Technology and Applied Industrial Science gained experience with a Eureka project in the environmental field. In addition to the first informational hurdle, he sees as a major problem the uneven competition between university institutes and similar research entities in the search for outside financing for SME's: "As industrial firms, they are unable to compete in the area of costs against a university institute." The reason for this is the "troublesome problem of overhead costs." The universities can simply leave overhead for everything from secretaries to workstations out of their bid calculations and thus submit competitively favorable project applications. The difference for similar projects can be as much as 150 percent. Fischer continues, "Of course, the university institute gets the contract."

Large Firms Can Also Absorb Research Costs

In such uneven competition SME's are fighting a losing battle. No SME can afford to absorb 50 percent of the costs of a project, according to Fischer. That is not the case with the really large enterprises, agrees Dr Friedel Breuer of the Technology Assistance Office of the Cologne IHK: "Large firms have people who can keep them informed about support programs." Furthermore, they have huge research budgets within the framework of their total design where some research costs can be interpreted as incidental expenses.

The problems described are also familiar to officials of the support programs. This is reflected in several ways, including the fact that "EC-counters" are now being set up—contact offices specifically for SME's where they can acquire information, advice, and contacts with EC-programs. These and other measures designed to reduce fears about making contacts and administrative hurdles are necessary to facilitate future participation of SME's in Eureka. After all, the intended support and union of innovation and technical progress in Europe can only be achieved efficiently without disruptive effects on markets with appropriate participation of this category of firms.

12666

FIAT Reports Financial Situation For Jan-Jun'87 Period

36980114b Turin ILLUSTROFIAT in Italian Oct 87 p 8

[Text] The FIAT board of directors, which met in Turin on 29 September under the chairmanship of Giovanni Agnelli, approved the company's report to the National Commission for Companies and the Exchange, accompanied by the consolidated economic and assets situation of the group and of FIAT S.p.A. as of 30 June 1987.

The first quarter of the year was a period of particular vitality for the FIAT Group, not only in the positive economic-financial results achieved by current management, but also because of the operational start-up of important programs of organizational, managerial, industrial and commercial integration relative to the acquisitions and alliances as a whole made during the past year.

In particular, one must remember the full inclusion of the effects of the Alfa Romeo operation in the auto vehicle sector and of Iveco-Ford UK and Astra in the industrial vehicle sector, as well as the consolidation of SNIA BPD.

Turnover

Net earnings for the first quarter of the year reached the figure of 19.847 trillion lira; net of the variation of the consolidation category, earnings would have totaled 16.6 trillion, with an increase of 16 percent over the first quarter of 1986.

Profitability

The good progress of the market, the increase of efficiency measures, and the further contribution of innovation enabled the FIAT Group to end the first quarter with an operating profit of 1.793 trillion lira, an increase of about 370 billion lira compared to the same period of last year.

The increase in profitability was achieved despite the higher costs for research and development (600 billion lira in the first quarter of this year, compared to 400 billion in 1986), the higher amortizations, the lower contribution of dollar sales due to the weakening of that currency in international markets, and the inclusion in the consolidated of the new acquisitions, which present an economic situation less strong than that existing in the FIAT Group.

Financial Indebtedness

The financial indebtedness of the Group was further reduced to 424 billion lira, compared to 706 billion at the end of 1986.

In fact, the reduction of net financial indebtedness during the quarter was even more substantial if one takes into account that at the beginning of the year, following the inclusion of the new activities, FIAT Group showed an indebtedness of 2.7 trillion lira.

Employees

With the acquisitions during 1986, total employment of the Group at the end of June was more than 275,000, with an increase of about 45,000 compared to 31 December 1986. One should note the resumption of hiring from outside with the addition of about 5,000 in 1986 and 4,000 in the first quarter of this year.

Progress of Sectors (compared to 1986

Operating Sectors	Net earnings Billion lira		Investments Billion lira		Employees (Number)	
	Jun 87	Jun 86	Jun 87	Jun 86	Jun 87	Jun 86
Automobiles	11,910	8,576	828	275	132,302	98,832
Industrial vehicles	3,223	2,566	90	43	35,709	33,435
Agriculture tractors	760	843	20	27	10,507	10,935
Earth-moving equip.	425	473	12	6	5,232	5,515
Metallurgical prod.	663	620	43	33	11,943	12,024
Vehicle components	1,407	{	112	{	29,869	
Industrial components	565	{ 1,886	31	{98	8,130	34,915
Lubricants	188	{	2	{	631	
Production means and systems	395	408	5	8	4,790	4,324
Civil engineering	242	179	3	7	2,218	2,749
Railway products and systems	90	91	2	2	1,150	1,166
Aviation	239	243	29	16	4,606	4,430
Telecommunications	267	197	19	16	5,115	4,831
Publishing	156	127	3	2	1,330	1,291
SNIA BPD	1,253	-	92	-	16,812	-
Holding companies and various	342	300	29	16	4,815	6,928
Total	22,125	16,509	1,320	549	275,159	221,375
Inter-exchange	(2,278)	(2,191)				
Group total	19,847	14,318	1,320	549	275,159	221,375

The table shows data on earnings, investments and employees as of 30 June broken down by operating sectors. As a result of the reorganization of the components sector, its activities were allocated in 1987 to the new sectors: vehicle components, and industrial components and lubricants.

The board of directors also reviewed the economic and assets situation of FIAT S.p.A., which in the first quarter of the year showed a profit before taxes of 725 billion lira, a marked improvement compared to the corresponding period of 1986.

Net financial assets reached 1.34 trillion lira as of 30 June, with an improvement of 285 billion compared to the end of last year.

Annual Progress Forecasts

In evaluating the positive results achieved by the FIAT Group in the first quarter, one needs to take two circumstances into account: on the one hand, the characteristic trend of current management that generally favors the first part of the year; and, on the other, the effect of the recent tightening-up measures in the value-added tax, which certainly produce some cooling of demand for some FIAT products. All this notwithstanding, the forecasts for the whole year foresee a still-positive 1987.

In the second part of the year, the restructuring actions were started for, among others, the tractor and earth-moving equipment sectors, which are to be integrated into a single company at the beginning of 1988.

For FIAT S.p.A, the economic progress forecasts for the whole year are very positive, even though it must be

considered that during the first quarter the company had already collected from the participants all the dividends foreseen for 1987.

9920

European Technology Institute Established in Italy

36980114a Rome IL FIORINO in Italian 10 Dec 87 p 3

[Excerpts] The European Institute of Technology (EIT) is a new initiative promoted by some of the most important companies operating in Europe in the sectors of advanced technology, among which Montedison, with the purpose of introducing different forms of cooperation between companies and universities in precompetitive research and specialized training. Being a cooperation more attentive to the new needs of the companies and based on joint implementation of specific projects, it contributes in a more clear-cut way in strengthening the factors of research and development in Europe. In fact, these are becoming increasingly important for the strategic choices that industry must make.

The EIT initiative, in addition to having goals and motives similar to the "Roundtable" project, is distinctive for two main reasons: the gradual approach and the timing of the proposal. The "graduality" in the commitments of the industrial partners enables step by step "construction" of the EIT. This means not limiting the initiative from the start with expensive structures, and makes it possible to proceed project by project in identifying, selecting, and using the existing structures, modifying their work method, maximizing and integrating the technical instruments, facilitating the communication, and subsequently, if necessary, proceeding to the creation of new centers.

The program for establishment of the European Institute of Technology involves two main phases. The first calls for development of an operating structure, with the task of enhancing the research and training capacity, both public and private, existing in Europe, and promoting a closer linking and greater interaction with the companies. Through the EIT initiative, the companies will be able to to derive maximum benefit from the training and research programs carried out by the universities; and the universities will be able to develop programs more directly responding to the needs set by the rapid progress of technological development. The second phase envisages the possibility of establishing new research centers specialized in sectors in which there are evident gaps to be overcome or new needs to satisfy. The mechanisms the EIT will use to achieve its objectives are establishment of the following: a network of researchers, both university and company, that should enable effective development of joint programs. That is, they will be the instrument to promote the processes of "cross-fertilization" between the industrial and university research communities. The starting point of establishment of the research networks will be organization of international scientific seminars on specific topics. These will be meetings closely restricted to the experts in individual technological fields in order to initiate joint research programs. Also, through the networks it will be easier to exchange information on the research projects initiated, their degree of progress, the results achieved and achievable, and the qualifications profiles needed for the various projects. The 1988-1989 program provides for launching the researcher networks, along with the electronic mail system, in the following fields: science of materials, technology of information, and biotechnologies.

The networks of the EIT's leading centers will connect with some of the main European research and advanced training centers. This type of network will constitute a decentralized EIT. The development of these networks will be an instrument to enable the following:

—Coordination of specialized research and training programs;

—Launching of new research programs that have been developed;

—Mobility of researchers between companies and universities.

The selection of the research centers to be associated with the networks will be carried out as follows:

—The universities and other research centers will present proposals for projects to be financed by EIT in sectors of interest to the member companies of EIT;

—Initial selection of the proposals, and provision of a grant to cover expenses for preparation of more detailed proposals;

—Financing by EIT of the most attractive proposals. This financing, to be regarded as "seed money," should then attract additional funds from the companies and the public sector.

The "Promotional Consortium of the European Technology Institute" will be established as a non-profit association.

9920

New R&D Directions at FRG's Karlsruhe Center

36980049 Duesseldorf HANDELSBLATT in German 9 Nov 87 p 21

[Article by Georg Heller: "Karlsruhe Nuclear Research Center, Greater Emphasis on Environment and Safety: A Research Factory With the Sales of a Large Company"; first paragraph is HANDELSBLATT introduction]

[Excerpts] Karlsruhe, 7/8 Nov (HANDELSBLATT)—Annual expenditures of the research factory in Karlsruhe's Hardt Forest are nearly DM700 million. In

numerous large research installations at the Karlsruhe Nuclear Research Center [KFK], more is happening than energy research and development and testing of energy technology. Environmental, climate, and safety research, assessment of the impact of technology, materials research, and physical techniques as well as handling technology also have a place on the 2 and 1/2-square kilometer grounds.

How is the money used, how is such a "large-scale research institution" financed and regulated, what good is it? A trip to Karlsruhe illustrates part of German national research policy. The KFK is poised at a turning point. For the past 20 years the major R&D emphasis at Karlsruhe was on nuclear technology, which has now been shifted extensively to industry. R&D in this field, which in 1982 still accounted for 70 percent of the total R&D expenditure, will now be limited for the longer term to some 30 percent, concentrating chiefly on developments especially in the area of the breeder fuel cycle, nuclear waste disposal, and the safety of large breeder reactors. In contrast, R&D expenditures for nuclear fusion are to increase from less than 10 percent of total Karlsruhe R&D expenditures in 1982 to 20 percent by 1994.

New Activities Based on "Waste Products"

Particularly noteworthy is the planned expansion of three fields: environment and safety, microtechnology, and handling technology. The last two, each of which should make up approximately 8 percent of the 1994 R&D budget, did not even exist yet in 1986. And the field of environment and safety, which received a couple of percent in 1983, should grow to over 20 percent by 1994. These fields grew out of the results of nuclear R&D and today lend the KFK more general significance extending far beyond nuclear technology.

Fundamental Work on Superconductivity

In the mid-1990's, microtechnology and handling technology should each lay claim to as much of the R&D program funds as solid state and advanced materials research which are likewise very productive. Fundamental superconductivity work is included in the solid state and advanced materials research at Karlsruhe.

The KFK only uses less than 10 percent of its capacity for basic research and that only in nuclear and particle physics. Chairman of the administrative board Prof Dr of Eng. Horst Boehm summarizes the charter to HANDELSBLATT by saying that "applied, technologically oriented research" and within that "complex, high risk developments" dominate according to the definition of goals set forth from the political side. The KFK is a so-called "large-scale research facility," and as such assumes the role of a intermediary between basic research and the application of scientific and technical results. According to the definition in the Baden Wuerttemberg state research report, the large-scale research facilities fall between the universities and the Max-Planck Institutes on the one hand and the Fraunhofer Institutes and industrial research on the other.

A Major Supplier for Nuclear Medicine

The compact cyclotron in the Nuclear Physics Institute of the KFK has developed into the largest producer of short-lived radioisotopes in the FRG. These isotopes are needed for nuclear medicine diagnostics. The procedures developed at the KFK are already being applied commercially in Japan and will soon be in the United States.

Also on the grounds is another cyclotron, a test facility for large superconducting magnets, laboratories for tritium technology, etc. In the research institutes and test facilities of this scientific city, over 5,000 people work, including more than 1,000 employees of other legal entities which operate nuclear technology prototype facilities under contract with KFK GmbH or are employed in joint ventures with private industry.

Profits from supply and disposal services as well as proceeds from research contribute DM174 million to the DM700-million budget. Approximately DM30 million is continuous funding for participation in projects, another DM30 million is from special financing, and DM518 million is procured from the federal government and the state of Baden-Wuerttemberg at a 9:1 ratio as "grants." The 12-person board of directors includes representatives of national and state government, the university, the private sector, trade unions, and employees.

The GmbH with capital of DM1.0 million is subject to oversight from Federal Audit Office. Intermediate-term planning and the R&D program are submitted jointly by the "board" (as the management team is called) and by the scientific board to the board of directors for approval. According to management, the [scientific] board is a "committee for scientific codetermination" consisting of institute and project leaders and selected employees.

Close ties are maintained with the neighboring universities. Some dozen of the institute leaders at KFK reportedly also hold faculty positions at one of the universities in Karlsruhe or Heidelberg. In addition to "establishment and operation of R&D facilities with the objective of discovering, collecting, and evaluating scientific and technical knowledge and experience in the interest of the general public," the mission of the KFK is the practical training of the next generation of scientists and technicians.

Exploitation of Patents and Licenses

Industrial exploitation of the results obtained at the KFK occurs after they are legally protected, through licensing contracts. The center holds approximately 1,800 patents, and 280 licensing contracts are currently in effect. Federal and state government support technology transfer: For approximately 10 years, the KFK

has been allowed to apply two-thirds of all revenues from licensing and proprietary information contracts—at present, the annual two-thirds is approximately DM15 million—for technology transfer purposes in house. The emphasis is on the areas of measurement technology, low-temperature technology, materials, isotope production and application, waste water purification, filter technology, remote control technology, apparatus engineering, process technology, and data processing.

12666

COMPUTERS

CSSR: Exhibits of Computer Related Products in Budapest

25020023a Budapest
COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 24, 2 Dec 87 p 1

[Unattributed article: "Electronic Contact"]

[Text] Between 26 and 30 October, at the Rakoczi Street House of Technology in Budapest, the electronic industry of Czechoslovakia was introduced in an exhibit titled Elektrokontakt'87. Computer technology products figured prominently along side the new electronic items at the displays accompanying the professional lectures.

The Datasystem enterprise of the ZAVT Concern had the largest and most detailed exhibit. They displayed in almost complete form so-called problem-oriented systems operated by SZM 52/12 or M 16-22 minicomputers in the MSZR [uniform minicomputer system] series. The former is a 32 bit VAX compatible minicomputer with a maximum of 128 megabytes, operational memory and a virtual address domain of 4 gigabytes. A graphic workstation which included a drum plotter was connected to the system. The modular, 16-bit, PDP compatible M 16-22 can also be used for interactive graphic design, whether this involves the finite element method or NC tool design.

Products with smaller size and capacity were shown as well. The keyboard and outputs of the PP 01 personal computer, which has put on a bit of weight, suggest quite serious use possibilities even if it has only an 8-bit processor. The PMD 85-3 is a 64 kilobyte machine with a more pleasing appearance which can be programmed in BASIC-G. The Tesla single box, built-in cassette data store and matrix printer can be connected to it. Owners of similar microcomputers might be interested in the mini-plotter, the XY 4140, which was connected to a C-64 and is of similar size to it. The positioning precision of the plotter, which moves A/4 size sheets of paper, is surprisingly good. We are informed that the EMO [Elektromodul electronic parts trading enterprise] is discussing import of it.

The exhibit included a significant number of devices controlled by microprocessors, from the well known Czechoslovak sound technology equipment through medical and laboratory instruments to video technology. Between 1981 and 1985, the Czechoslovak electronics industry achieved a growth of almost 150 percent and they expect even more dynamic development in the next 5 years, especially in the area of microelectronic parts manufacture.

8984

Hungary: Highlights of Software 88 Fair

General Survey; CAD/CAM Exhibit

25020023b Budapest
COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 24, 2 Dec 87 p 4

[Article by "G.T.": "Colorful Subsystems"]

[Text] This year the CAD/CAM systems were separated from the rest of the software; or more precisely, the firms invited by the sponsoring organs were awarded a separate exhibit room.

The performance of the TPA-11/584 dual processor machine of the KFKI [Central Physics Research Institute] can be used best in CAD applications. The smaller machine category included a VT 32 with Finnish-designed pipeline architecture software. Graphisoft, the Applications Technology Small Cooperative and the Machine Manufacturing Technology Faculty of the BME [Budapest Technical University] appeared with their programs. We saw Coopgrading and GRATIS, which won a prize. The FLEXYS company exhibited a free-form surface (FFS) system and the FlexCell cell control system, which also won a prize, and the Industrial Technology Institute exhibited its technological design programs which can be connected to NC machines. And we could become acquainted with two foreign exhibitors, the Austrian firm Sysgraph and the California firm Interconcepts.

The listing is not complete but it perhaps illustrates that there are already a few systems which might excite the interest of Hungarian industrial enterprises. More vigorous industrial policy steps can now be felt in the CAD-/CAM area—after many years of indecision or inaction—but there is still very little money which can be devoted to such developments. There are few firms which can undertake comprehensive, integrated realization of modern designing-manufacturing systems, sell them with a guarantee, undertake software follow-up and make the connection between CAD and CAM on the spot. In general domestic CAD/CAM developments are pursuing two paths—either they are trying for supplemental electronic automation of existing machines and connect CAD elements to these retroactively or they are trying to equip some brand new manufacturing shop with CAD/CAM equipment.

Sixty to seventy percent of the installed CAD/CAM systems are custom developments. And how much work this means—especially under Hungarian conditions where even devices from the same manufacturer are not always compatible with one another—might be indicated by what was said by a BME professor at a seminar connected with the CAD/CAM exhibit: "It's a damned hard job."

Grand Prize Winner GRATIS

25020023b Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 24, 2 Dec 87 p 3

[An advertisement by the co-owners and vendors: SCI-L, Softinvest and Soft-Coop]

[Text] The grand prize winner at Software'88 was the GRATIS, Graphic Database Management and Designing Interactive Software [GRafikus Adatbaziskezelo es Tervezo Interaktiv Software].

It is a two and three dimensional, general, conversational developmental program package which contains nearly 150 graphic editing and database management commands. It is a basic system suitable for developing user CAD systems with the aid of interface software (which can be ordered separately), the necessary graphic peripherals and a universal peripheral coupling to connect them.

We recommend GRATIS for:

Enterprises planning to introduce CAD systems; Conversational preparation and storage of planning institute documentation; Archiving and multiple use of large volumes of graphic information; and Development of user CAD systems (we will also undertake preparation of these on special order).

8984

FACTORY AUTOMATION, ROBOTICS

GDR Plans Multitiered Applications of Small-Sized Computers

23020005 Berlin RECHENTECHNIK DATENVERARBEITUNG in German No 10, 1987 pp 14-18

[Article by K.W. Peselev of the Coordinating Center of the Multifaceted Government Commission on Cooperation Among the Socialist Countries in the Area of Computer Technology: Future Development Directions for SKR]

[Text] The programs undertaken within our countries to intensify machine construction based on the use of robots, the complex automation and widespread introduction of flexible production cells and systems, as well as the automation of the design process, are based primarily on the SKR series of microcomputers and small computers which were created within the scope of socialist integration. These computers were developed so that they would work together within a standardized computer system (distributed throughout a modern plant) and provide optimum support to the actual user. This is why the less sophisticated microcomputer models have special design versions which are intended for continuous operation in a production environment (e.g. CM 1804, CM 1814). Planning, control and management tasks at the level of manufacturing sectors and enterprises will be handled by the more advanced CM 1420 small computer models and in the future also with the model CM 1700 family of computers. For critical automation systems such as in electrical energy and nuclear power stations and high-performance technical systems, the user will be provided with two-computer systems with widespread redundancy.

Strategy for Introducing Computer Resources

The task of intensifying the national economy while production is underway also requires a precise definition of the strategy for introducing computer resources.

As experience at home and abroad has shown, one of the most effective ways of introducing computer technology is through the broad-based construction of various types of complex integrated automated control systems (KI ASU). Flexible manufacturing systems (FFS) are an example of such KI ASU. The high technical and economic level of KI ASU is the result primarily of the complexity involved in automating information processing (on an integrated basis using distributed computer systems), which ensures efficient adaptation of the computer resources to concrete user activities. Below are some of the new areas which can be realized using KI ASU:

— Introducing the kinds of highly efficient technological processes into small-series and specialized production which up to now were peculiar only to large-scale or mass production.

— New types of products without forced production downtime and with minimal loss of productivity.

— Variation through organizational structures.

The scope of KI ASU must ensure the coordinated accomplishment of tasks which up to now have been performed within such subsystems as regulation of technological processes, measurement and control of final product quality, automation of the design process for new types of products, dispatch control, operative planning, technical and economic cost accounting, and supplying of information for management decisions. It must also be emphasized that within the scope of KI ASU (as a closed control system) it is possible to optimize controls according to the final result achieved in the workings of complex technical programs.

Requirements in Terms of Computer Resources

The broad spectrum of the qualitatively new information processing tasks which must be accomplished when KI ASU are established leads to new and complex types of requirements in terms of computer resources. The most important of these—requirements fulfilled by the SKR family of computers—are the following:

- Ensuring cooperation between various types of computer resources within one computer system.

- Various types of operating peripherals which must enable effective use by operators with relatively little training.

- A broad assortment of operating systems (high-speed real-time systems, multiple-user systems and user software, etc.).

- Extremely high reliability (at the level of the reliability of the technological system being controlled).

- A broad assortment of devices for forming complex multiple-computer systems, of aids for remote processing and of devices for constructing network configurations for various purposes.

- Realizing new types of work regimens (reconfiguring when modifying the output situation and when equipment failures occur).

In modern complex integrated automated control systems which, as already mentioned, also include flexible manufacturing systems, the following four system levels can be described from the standpoint of requirements in terms of computer resources:

- "Aggregate" control of a single, small (up to 64-120 channels), localized technological project (machine tools, stackers, electrolytic baths, thermal furnaces, automated individual work stations).

- Control of a technological process (systems for multiple-computer) group control of technological units (DNC in machine construction), centralized automated work stations with numerous terminals and functions, functionally separate systems with functional redundancy for reconfiguring during use.

- Control of a system of technological processes , e.g. at the level of a production sector using computer systems organized within local networks.

- Interlinked, complex systems for controlling complicated production projects, e.g. at the level of an enterprise or an association of producers.

SKR and Flexible Manufacturing Cells and Systems

The Soviet program for creating flexible manufacturing cells and flexible manufacturing systems (FFS) was closely tied to the SKR family of computers. The structure of a distributed computer system comprising several computers may serve as an example of how a flexible manufacturing system is constructed using SKR resources (Fig. 1). Fig. 1 shows in detail the basic tasks which are to be performed using the basic SKR model at all four levels of the flexible manufacturing system.

Level 1 Requirements

The following requirements are placed on computer resources at level 1 (aggregate):

- Extremely high reaction capability of the real-time system.

- Extreme reliability (at the level of the reliability of the system being controlled—failure interval up to 10 to 30 thousand hours).

- Possibility of built-in construction (on one to four printed circuit boards).

- Functional completeness of coupling modules.

- Possibility of independent operation in the event of malfunctions and deviations in higher-level control systems.

- Ability to function in an actual production environment.

Derived from these basic requirements is the need to ensure operational capability in a "non-peripheral" configuration using a main-memory-resident operating system (e.g. type MIOS RW) when interfacing with a level II computer via 1-2 lines within the scope of locally distributed structures.

Fig. 1 SKR Equipment in Flexible Manufacturing Systems

1.1 Input inspection, quality control, overall testing

1.2 Level II

1.3 Multiplexers

Operator terminals

ILPS

1.5 to 3 km, 500 baud

Level I

1.7 Process interfaces

2.1 Operative planning, dispatch control, control of manufacturing sector

2.2 ADS-S remote interface

2.3 Level III

2.4 80 to 300 Mbyte disks

2.5 Centralized database

2.6 Gate computer

2.7 Work stations for management personnel and specialists

3.1 Enterprise management

3.2 Level IV

3.3 ESER

3.4 Open ESER network

4.1 Measurement and testing sector, equipment calibration

4.2 Level II

4.3 Coordinate-axis measuring machine

4.4 Transport system

4.5 Level I

5. Equipment for standardized local network within an enterprise:

MPD-A and MPD PSA multiplexers

6.1 Main production, thermal processing, surface treatment, assembly department

6.2 Level II

6.3 Group control of equipment

6.4 Multiplexers

Local industrial network

6.5 Level I

6.6 Departmental management, collection of information concerning production run

6.7 Robots

6.8 Transport system

6.9 Control of equipment, transport control

7.1 Technical office, technical and design preparations for production

7.2 Level II

7.3 Level I

8.1 Supplies of technical materials, warehouse stock management, services

8.2 Level II

8.3 Automated warehouse

8.4 Level I

Figure 2. Conformance of Software Features (SKR) With Base-Level Requirements of Integrated Automated Control Systems

Class	Name	Functions	Levels of FFS			
			I	II	III	IV
Operating System	RAFOS, MIOS RW	Real time, extremely fast reaction capability	+	x		
	OS RW, MOC, MIKROS,ROS RW, MIKRON-16	Virtual systems, redundancy-capable main memory, 2-4 Mbytes, multitasking	x	+	x	x
	DOS KP, DIAMS,MIKROM-16	Multi-user operation		x	+	+
	INMOS	Portability	x	x	+	+
	TMOS, EKSPERT	Expanded diagnostics	+	+	+	+
	OSW	Virtual system, 32-bit main memory up to 15 Mbytes		x	+	+
Basic software	SUBD (BARS, SETOR,RIBD), FOBRIN-2, MIRIS	Databases distributed in relational hierarchy	x	+	+	+
	CUD	Administration of data files with serial, subscripted, relocatable organization	+	x		
	PP SETJ, CM TODAS, PP SETJ MIKRO	Homogeneous local SKR networks		+	+	+
	MMK/L, MMK/R, CPO, OBMEN-2	Operation of SKR devices as local or remote terminals		x	+	+
	PPP SETJ EC EWM	Operation as nodes in open SKR network		x	x	+
User software	Multi-channel control	System- and object-oriented packages	+	x		
	Graphics			+	+	x

Figure 2. Conformance of Software Features (SKR) With Base-Level Requirements of Integrated Automated Control Systems

Class	Name	Functions	Levels of FFS			
			I	II	III	IV
	Scientific and engineering calculations			x	+	+
	Economic accounting			x	+	+
	Modelling			+	+	+
	Statistical accounting		x	x	+	+
	Work with special processors		x	+	+	+

Programs, data and default values are loaded via communications lines from the level II (higher-level) computers and are used to coordinate and optimize control of the system (according to optimization criteria for control of the technological process as a whole). In addition, service information (work on peripheral equipment, diagnostic signals) and operative information are transmitted to level II via these lines (data on the status of the system, of the technological process and of the system of calculations; signals for coordinating the steps in preparing for the subsequent processing levels).

The unique features of the information exchange between the lower level (system) and level II (technological process) include the relatively high degree of constancy with regard to the exchange: Loading of programs to the lower level and the transmitting of service information. At this level the method of exchange used corresponds to that of the so-called local industrial networks. This can be accomplished with the SKR over standard ILPS or IRPS lines using standard Satellit software (implemented within the scope of IWK-6/3/).

More effective operation is achieved by main-memory-resident systems with extremely high reaction capability when coupled to the MIOS RW and OS RW operating systems via the Setj user program package.

Level I of the flexible manufacturing system, including a subsystem for the control and measurement of quality parameters, an integrated transport control system (production line, automated warehouse), controls for machine tools, forging presses, auxiliary technical equipment, etc., is implemented using class CM 1300, CM 1300.01, CM 1800, CM 1804, CM 1810, CM 1814 microcomputers and modifications thereof.

Level II Requirements

The following tasks must be accomplished at Level II in the flexible manufacturing system (technological process):

- Operative adherence to the models of the objects being controlled at the "system/ technological process" level; revision of the models according to the results of processing the information from the lower level .

- Determination and selection of the control rules and defaults which correspond to the necessary quality parameters for control and the actual (or precalculated) parameters for the object being controlled.

- Synchronization and stabilization of the work of 4 to 16 lower-level control systems (system) within the framework of group control (DNC class) of the technical equipment.

- Automating the development of control programs, storing them in memory and remote loading of the programs into computers for system control.

- Maintaining a common database for the technological process (real-time)

- Monitoring the functional capability of the equipment at the lower level; reconfiguring the system according to the selected work method.

- Tie-in to level III.

In order to meet these requirements the SKR computer systems must exhibit a sufficient degree of performance capability at control level II and this must involve real-time operation as well as the solving of typical scientific and technical problems, the processing of graphics information, real-time operation of medium-sized databases (up to 100 to 300 Mbytes), work with an enlarged spectrum of intelligent CRT terminals and automated individual work stations.

The CM 1300.01 and CM 1810 models fulfill all of the basic requirements of the average level II control system for flexible manufacturing systems. The CM 1810 has advantages in terms of performance capability, while the CM 1300.01 model is advantageous with regard to the scope of system and user software and to compatibility with higher levels of automated control systems.

The conformance between the SKR software features and the requirements of the basic levels of integrated automated control systems is shown in Fig. 2.

The level II requirements for flexible manufacturing systems are met most completely by the CM 1420 which comes in one- or two-printed-circuit-board designs (CM 1420*).

In information processing subsystems for complicated measurement and information systems, as well as in systems for production preparation related to technical matters and design, the use of information and computer systems and automated work stations which are based on the CM 1420 (CM 1420*) or the 32-bit CM 1700 super minicomputers serves the purpose. In this regard it is necessary, in addition to enlarging the external storage capacity to 100 to 300 Mbytes, to increase the amount of peripheral equipment by taking advantage of the options of semi-automated entry of graphics information, of graphics terminals and of plotters, and by doubling the amount of basic system equipment. The level II computers must be interfaced to a uniform local network within the enterprise (with a connection to control level III) via SKR auxiliary hardware and software.

Level III Requirements

Level III (production sector) is characterized by the need to perform a new class of tasks (operative planning and dispatch control), which in automated systems involves management of the enterprises (ASUP) from a computer center within the enterprise.

Performing these tasks within the production sector ensures optimized control of the resources of the production sector as a common organizational and technological element. At the same time the preselections from the higher levels and the actual condition of the system being controlled are viewed objectively. The proper time frame within which revisions in the prediction model are made and the task to be performed by the technical equipment is precisely defined is 0.5 to 2 hours. These features, as well as the requirements of maintaining a production sector database with from 100 to 500 Mbytes, ensuring parallel operation of four to eight intelligent terminals or automated work stations, and the work of two systems with distribution and redundancy with respect to the basic control functions, are accomplished most completely by the CM 1420, CM 1420* and CM 1700 models. It must be emphasized that at the upper levels of flexible manufacturing systems the effectiveness of information processing increases substantially with the availability of the 32-bit models of the CM 1700 class of SKR super minicomputers.

The level II computers are linked to higher-level SKR systems via standardized SKR network protocols controlled by the SIO application program package and also using adapters and multiplexers supported by this program package for their work within the computer network.

Level IV Requirements

In order to connect to level IV, in which it is possible to use ESER systems, auxiliary equipment must be placed between SKR and ESER equipment (within the enterprises by means of remote EC 7920 terminals or ESER network nodes using the X.25 protocol which are connected via the ADS-S synchronous adapter).

Since the problems to be solved at level IV (enterprise) differ fundamentally from those of the lower level from the point of view of the auxiliary computer equipment required, the basic model at this level must be the ESER. Only in relatively small enterprises can the CM 1420 (CM 1420*) and CM 1700 be used as multiple-computer systems.

Experience at home (in the Soviet Union) has shown that the basic questions regarding the construction of multiple-computer systems for flexible manufacturing systems can be solved using serially produced and developed SKR computers. This is one of the most important factors for choosing the SKR as the basis for constructing various classes of integrated automated control systems and flexible manufacturing systems in the most important sectors of the national economies of our countries.

SKR and Peripheral Equipment

The basic processors, the major classes of peripheral equipment, the auxiliary equipment for remote data processing and for configuring multiple-computer systems, as well as the kinds of interface controllers which precisely define the orientation of the SKR with respect to the areas of application, are listed in Fig. 3.

Fig. 3 SKR Equipment

- Disk Storage

CM 5400 4.8 Mbytes

CM 5410 9.6 Mbytes

CM 5408 16 Mbytes

CM 5407 29 Mbytes

- Winchester Disks

20 Mbytes

80 Mbytes

120 Mbytes

300 Mbytes

- Process Interfaces

UKB - 200

UWA

UWD

- Computer Interfaces

USWM - SKR

AMS - SKR

Two-channel controller for peripherals and main memory

- Special Pro cessors

BPF x 50

PMP x 10

"MIR" x 5

EKONOMIKA x 2 "MODELIROWANIE" x 100

- Graphic Input/Output

Semi-automatic input:

1 to 100 dots/s

Plotter: 300 mm/s

- Intelligent Graphics Displays

AZW CM

UWT CM

EPG CM

WTA 2000.17

EPG 3 CM

- Universal Bus

- Microprogrammed Controller

- Bb/Universal Bus

- Electronic Disk

4 Mbytes

16 Mbytes

- Cassette-Type Magnetic Tapes

CM 5202 5.6 Mbytes

CM 5206 0.5 Mbytes

Cartridge 2.8 to 40 Mbytes

- Interface Module

- USOSCH

IRPR

IRPS

- CAMAC Controller

Modules

- Q-Bus/Universal Bus

E-60, E-80, NZ 80-31 . . .

- Universal Bus/2K

CM-2 modules

- Magnetic Film Storage

130 to 200 mm, 90 mm

0.5 to 1.5 Mbytes

- Printers

100 to 180 characters/s

500 to 600 lines/s

Dot-matrix printer, chain printer, ink-jet printer, laser printer, thermal printer, electrostatic printer

- Process Interfaces

Complete nomenclature of process interface modules

- Remote Network Processing

- Adapters, Multiplexers, Commutators, 50 to 48,000 Bd Modems

SKR network

Local network/ILPS-2

MULTILINK network loop

ETHERNET

- Remote Terminals

- SKR Processors and Computer Systems

Homogeneous SKR network

ESER network

Magnetic Disks

The CM 5402 (CM 5400), CM 5415 (CM 5408) and CM 5407 magnetic disks currently have a capacity of 4.8 to 80 Mbytes. Because two to eight magnetic disk units can be connected to one controller, off-the-shelf disk units fulfill the system disk requirements and open up the

possibility for databases with very fast access times and large capacity. The problem of increased reliability, primarily for automated systems, is solved with the development of Winchester disks (10 to 160 Mbytes).

In order to create system devices capable of fast reaction times based primarily on microcomputers without memory dispatchers with a capacity of two to four Mbytes, electronic disks are being series-produced (peripheral four-Mbyte semiconductor memories with fast access times which are limited only by the reaction time for direct access to the main memory). These devices have a memory file organization which corresponds to that of the magnetic disks and they can operate with standard magnetic disk drives without any revision of the system software.

Thanks to the reduced requirements in terms of service conditions and to the low cost, magnetic film storage units are used either as system units for microcomputers or as devices for ensuring data transmission compatibility between different systems. The CM 5631 (EC 5074) magnetic film drive is currently the most widely used unit. In the future, film storage units with larger capacity (3.2 to 12.8 Mbytes) will be available and will have smaller dimensions (130 mm and 90 mm diameters).

Magnetic tape storage is for the establishment of data archives and for storing information which is constant only in part.

Depending on the SKR system class involved, either reel-to-reel type (CM 5301 - 20 Mbytes, CM 5003 - 40 Mbytes) or cassette-type (CM 5208 - 0.8 Mbytes, 5211 - 0.5 Mbytes) magnetic tape units are used. For using larger-capacity disks or disks with greater access speeds (Winchester disks), the development and production of so-called streamer magnetic tape units with no less than 10 Mbytes is required. These storage units must be made available largely in conjunction with systems which use Winchester hard disks; these units assume the tasks of loading the disks during the start phase and of storing the intermediate (final) status conditions at the moment the running of a given task is interrupted. In order to reduce the amount of time expended, the Winchester disk controllers must permit recording of all the information onto the streamer tape in parallel with recording the information onto the disks.

Special Processors

The performance capability of SKR systems can be substantially increased (5 to 100 times) by using special processors. Microcomputers for the corresponding class of algorithms have the performance capability of large-scale EDP systems. At present, the following special processors are in widespread use:

- Fourier processors for performing information processing tasks which are associated with the performance of a large number of Fourier transforms (analysis of radar signals, etc.).

- Parallel array processors for performing filtering tasks, vector and matrix operations, Fourier transforms, etc.

- ANALITIK language processor for interpreting the ANALITIK language of the MIR family of computers (used for scientific and engineering-related computations).

- Language processors for the economics field for performing economics-related tasks (based on the economics processor and the CM 1420 computer, the problem-oriented CM 1600 multiple-processor system was created for performing planning calculations and solving economic problems).

- High-performance special processors for modelling of electronic circuits.

Special processors for image processing, database management , etc., are also under development.

Regarding SKR Improvements

Enlargement of the area of application and the necessity of adding electronic capability throughout the nation requires substantial improvements in the SKR. This is true in particular with regard to its broad application in the following areas:

- Overall automation of tasks, technological processes, sectors and areas (up to the level of flexible manufacturing systems)

- Automation of planning (scientific and engineering activity)

- Automation of management and controls (organizational/economic activity)

- Automation of continuing education and training

In this regard, future SKR models will be oriented toward increasing the level of problem orientation in the areas of application listed.

Increased reliability must be achieved by expanding functional options in terms of hardware (configuration modules, two-channel controllers and two-channel peripherals) and software (restart, autostart, reconfiguration, automatic diagnostics, system support for functionally separate structures) and by creating systems designed to operate under industrial conditions. An important aspect of increased SKR effectiveness is development in terms of microcomputers (intelligent process interface units, industrial controllers, "Finkarten" computers) as well as in terms of very

substantially increasing the performance capability of superminicomputers and ensuring the establishment of well-developed network configurations comprising a number of computers.

The development directions for computer engineering described here are being realized in Series 4 of the SKR which is under development within the framework of socialist integration/7,9/.

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12552

GDR Maschinebuilding Units Investigate Flexibly Automated Assembly Lines

23020004.a Berlin FERTIGUNGSTECHNIK UND BETRIEB in German No 11, 1987 pp 679-682

[Article by Dr. K. Trinsinger, KDT, Dr. P. Albrecht, KDT; Engineer U. Naubereit, KDT, VEB Forschung, Entwicklung und Rationalisierung des Schwermaschinen-und Anlagenbaus Magdeburg [Research, Development and Streamlining of Heavy Machine and Plant Construction Magdeburg, Operating Unit Dresden: "Flexibly Automated Assembly Systems"]

[Text]

0. Introduction

Flexible assembly automation has become the focus of scientific-technical work in the field of manufacturing technology. The proportion of manual assembly work is still relatively high. This provides great opportunities for future streamlining which requires the development of automation solutions even though the assembly processes are very complicated. A few automated assembly stations and flexibly automated assembly cells for machine building have already been established as pilot solutions. In this article we will report on two flexibly automated assembly systems which will be used as assembly lines. A few system elements of the assembly line, a press station, a screw insertion station, and a retaining ring insertion station will be discussed.

1. Assembly Line for Check Valves

An automated assembly line will be used for assembling check valves with a nominal diameter of 15 to 65 which are produced in seven different sizes.

The check valve components are shown in figure 2 [not reproduced].

The automated assembly line consists of a transfer system with a dual chain drive, a flexible industrial robot SKR 30 for positioning the valve housings and tops, as well as several assembly stations which are mounted directly onto the transfer system (figure 3). They are:

—Assembly station for inserting flexible seals with suction grips;

—Quadruple screw insertion station with hydraulic drive and automatic feed of standard parts;

—Station for attaching the handwheels with IR-modules (IR-M) and sensor head for positioning the square;

—Nut insertion station with automatic feed of standard parts;

—Station for transferring the assembled valves to the test stands with IR-modules.

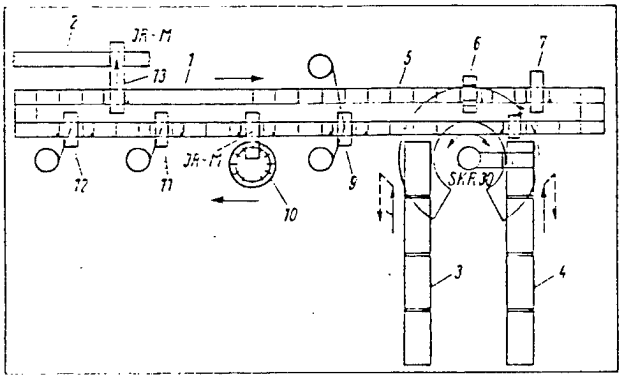

Figure 3. Lay-Out for Assembly Line for the Automated Assembly of Check Valves.

Key:
—1. Transfer System
—2. Test Section
—3. and 4. Pallet Transport Systems
—5. Workpiece Carrier
—6. to 13. Assembly Stations

The assembly line is flexibly designed for the automated assembly of the sizes mentioned and also for different check valve versions having these sizes. The valve housings are taken up by adjustable workpiece carriers, are stopped in these carriers and clamped automatically.

These assembly units are then transported to the respective station, separated by special indexing devices, and positioned by lifting devices. Standardized transport pallets are being used for moving the valve housings and tops which are brought to the IR work area by pallet transport system. A vertical tilting arm robot SKR 30 is used as a flexible robot. For inserting the seals, attaching the handwheels, and transferring the assembled check valves IR-modules of VEB Robotron-Rationalisierung [Streamlining] Weimar are being used.

Valve assembly is automatic; the valve top which consists of a bracket cover, spindle, taper, and stuffing box packing is already preassembled. With a cycle time of 0.5 minutes, the facility is run in three shifts. One operator per shift is still required to monitor and service all systems. The automated assembly stations are controlled autonomously. In case of partial malfunctions individual installation sections can be used separately until the malfunction has been repaired.

2. Assembly Line for Small Compressor HS 1-40/70 Subassemblies

The small compressor HS 1-40/70 (figure 4) of VEB Harzer Kompressorenwerk Benneckenstein consists of more than 80 components and standard parts with 40 different types. Since the product is so complicated the assembly process to be automated must be divided into subsystems and requires gradual automation. At present, the VEB Research, Development, and Streamlining of Heavy Machinery and Plant Construction Magdeburg, Operating Unit Dresden is testing the first assembly line for the automated assembly of the crankshaft and connecting rod/piston subassemblies in their laboratory.

The assembly line (figure 6) consists of the following main pieces of equipment:

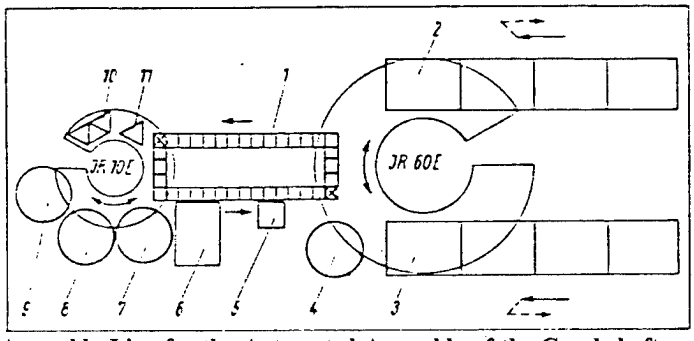

Figure 6. Lay-Out of the Assembly Line for the Automated Assembly of the Crankshaft and Connecting Rod/Piston Subassemblies.

Key:
—1. Transfer System
—2. and 3. Pallet Transport Systems
—4. and 7. to 9. Circular Indexed Storage
—5. Retaining Ring Insertion Tool
—6. Flexible Press
—10. Gripper Magazine
—11. Magazine for Seal Rings

—Fluid-based transfer system with workpiece carriers;

—Industrial robots IR 60E and IR 10E;

—Flexible press station;

—Retaining ring joining station;

—Two doubledeck pallet transport systems.

All workpiece storage devices accept components for two shifts. The essential part of the first assembly line is the transfer system (figure 8) [not reproduced] which is arranged in a square with workpiece carriers which have take-up elements for the automated assembly of the connecting rod/piston subassemblies.

The two industrial robots, the press station, and the retaining ring insertion stations work in parallel.

In contrast to the assembly cell where all assembly operations on an assembly unit are carried out sequentially, on an assembly line the same assembly operation is repeated several times depending on the number of workpiece carriers. This has the advantage that the grip or gripping finger does not have to be changed for each assembly unit, thus reducing idle time.

Approximately 15 seconds were scheduled for placing and/or inserting the components on the workpiece carrier with the industrial robot regardless of the type of component and the distance of the storage unit from the fastening unit. Test results showed that a cycle time of 12 seconds is possible with the IR 10E.

The assembly line for the connecting rod/piston and crankshaft subassemblies constitutes the first expansion stage of a flexible, automated assembly system for the small compressor HS 1-40/70.

The assembly system will be gradually expanded by two assembly lines which have basically the same layout.

To connect the three assembly lines another transfer system is planned which functions as an intermediate storage area and makes it possible to fully maintain production with a manual conveyor belt assembly in case of damage.

3. System Elements

The basic system elements of the solutions envisioned are assembly stations which allow the implementation of joining operations. In the VEB FER BT Dresden such automated assembly stations have been developed for pressing, screw insertion, and insertion of retaining rings. The flexibility of the solutions with regard to positioning and tool change makes it possible to use these automation solutions on a broad scale.

On the assembly line for the connecting rod/piston and crankshaft subassemblies for the small compressor HS 1-40/70, for instance, a flexible press station for five longitudinal press connections as well as a retaining ring insertion station for two bore hole retaining rings are being used. A flexible screw insertion station is used for a number of screw connections in the small compressor.

3.1 Press Station

The press station is used for all longitudinal press connections which are required in the assembly line. This requires an automatic tool change as well as press operations at various positions across the workpiece carrier.

Figure 9 [not reproduced] shows a partial view of the press station.

On top, a hydraulic cylinder is fastened which generates the necessary pressure up to 25 kN. The tool storage unit is positioned so that it can be rotated; it is driven by a motor via a friction wheel and indexed in each tool change position.

A tool chuck is screwed onto the piston of the hydraulic cylinder which is closed by spring force and opened by compressed air.

The tool storage unit is designed for holding eight tools. The tools are held in place by a ball seat; in addition, a stop is used to protect them from falling out.

For designing the press station, design documentation from the Technical University of Dresden, Section 13, was reused.

To be able to carry out press operations at various positions of the workpiece carrier, the complete press was additionally fastened to a positioning module [1].

This module is designed in such a way that a top part together with air bearing plates attached to it is located on a sliding track. Applying pressure to the air bearing plates allows a shift of the top part under high load (approximately 5 kN) with forces as small as approximately 50 N. The shift movement is performed by two pneumatic translation modules which are mounted with a 90 degree offset. One of the modules is connected to the top part und the other to the sliding track using rubber springs. Movement to specific positions is ensured by stop bars and pneumatic stops.

The press is designed with enough flexibility so that it can be used pretty much universally as part of different assembly systems.

It has an independent control which organizes the complete, fixed-program internal process sequence. For automatic operation, the process parameters tool selection, press position, and control commands as well as the

process sequence which are important for a flexible operation are preset by a master computer as a variable program part. If the press station is to be used as a technical unit together with an industrial robot—as in this case—the variable process data of the press station can be entered via the operational program of a freely programmable industrial robot control.

This version of splitting the press control into a variable master controlled and a fixed-program, press-resident part has the advantage that the control can do with a minimum number of coupling channels between master and press control.

With manual control, all variables can be entered at the press station via an operator command. The press control consists of hard-wired TTLlogic (TTL-control, VEB Erfurt-Elektronic).

3.2 Screw Insertion Station

Since screw insertion accounts for approximately 30 percent of all assembly operations and will continue to be more important than all other joining methods, flexible assembly systems also require screw insertion stations [2] [3] [4]. Efficient, automated screw insertion requires among other things that the product to be assembled is designed for automation and has standard parts suitable for automation.

VEB, FER, BT Dresden has developed a flexible screw insertion station which will first be used for automatically bolting together the small compressor HS 1-40/70. For this purpose, the industrial robot modular system ZIS 995 will be used; it will be adapted to control IRS 650 by retrofitting the drives and the transducer system. The use of suitable translation modules results in a work space of 1,000 mm x 1,000 mm x 400 mm.

The translation unit for movement along the z-axis is also used as the screw axis. A robot motor RSM 60 is used to drive the screw insertion. The drive shaft is guided through the translation unit to the screwhead changer.The screw axis is controlled directly by the IRS 650; it is therefore programmable and constitutes the fourth numerical robot axis. The use of a torsion-controlled transducer which is built into the screw axis makes it possible to control the torque or angle of rotation.

The initial set of tools included a screw head for set screws M8 [5], a screw head for nuts M8 [6], and a depositing head for washers [7]. They are located in a tool magazine and are deposited there automatically or connected to the screw axis.

The screw heads for set screws and nuts are permanently connected with a vibration helical feeder via a flexible feed hose and fasten their standard parts individually, taking advantage of the robot's flexibility.

The vibration helical feeders are located above the x-axis on a vibrator attachment. The screw head is used to feed the standard parts. This type of standard part feed is not suitable for washers. The washers are transported by a vibration helical feeder where the feed line is split up many times by a shunt device. This shunt simultaneously feeds four mandrels of a tapping system. The washers are presented individually since only the top washer is drawn up by the washer depositing head.

While set screws and nuts are inserted individually, the four washers are removed or deposited simultaneously.

3.3 Retaining Ring Insertion Station

A station for inserting retaining rings was developed to assemble retaining rings [8]. It consists of an insertion tool and a rack which is flange-mounted laterally to a standard module of the transfer system.

The joining tool is mounted to the rack by spring elements to compensate for imprecise positioning.

To mount a retaining ring the workpiece carrier is positioned under the station in such a way that the longitudinal axis of the assembly unit bore hole is located in the center of the longitudinal axis of the device. A pneumatically activated slide moves a retaining ring from a magazine stack through a guide slide via a press-fit taper. A sensing pin signals the presence of the retaining ring. A ram pushes the retaining ring into the press-fit taper. Due to the pre-stress force of the retaining ring and the ram movement the taper flange is pushed against the piston, and the ram pushes the retaining ring into the hole up to the groove. The magazine stack is designed for 350 retaining rings. It is refilled with a filling rod. The retaining ring insertion station can be controlled by the PC logic of the industrial robot control or by another microcomputer control.

4. Summary

Automated assembly lines are intended for the automated assembly of check valves with nominal widths of 15 to 65 and for the assembly of small compressor HS 1-40/70 subassemblies.

For this purposes, VEB, FER, BT Dresden developed solutions where the industrial robots IR 10E, IR 60E or SKR 30 as well as various industrial robot modules were used. Assembly stations operate at the transfer systems of the assembly lines. Here, both the press station and the screw insertion station allow for an automatic tool change and fastening operations at different workpiece carrier positions on which the assembly units are located.

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12831

METALLURGICAL INDUSTRIES

GDR Combine Develops New Laser Tempering Technique

23020009 Berlin TECHNISCHE GEMEINSCHAFT in German No 11, 1987 p 14

[Text] In collaboration with the GDR Academy of Sciences' Central Institute for Solid State Physics and Materials Research, the VEB Packaging Combine in Leipzig developed a new technique for tempering grooved rollers, using laser technology [no further details of the process given].

The selective laser tempering of grooved rollers used in the manufacture of corrugated fiberboard is based upon tempering a specific wear-stressed channel region of the corrugated [surface], with the possibility of adjusting the geometry of the tempering zone as well as the volume of the tempering in the corrugated surface.

Compared to the usual techniques of induction, nitrogen and ionization hardening which generally operate only upon the surface of the grooved rollers, application of the new selective laser tempering gives rise to essentially technical and economic advantages such as the elimination of cost-intensive refinishing (grinding), the prolongation of the service life of the rollers, lower retooling costs and more homogeneous tempering.

/09599

MICROELECTRONICS

CSSR: Fabrication, Properties of InP-InGaAsP Optoelectronic Devices

25020019 Budapest FINOMMECHANIKA/MIKROTECHNIKA in Hungarian No 9, Sep 87 pp 261-263

[Article by J. Kovac, F. Uherek, R. Srnanek, J. Jakabovic, S. Satka, L. Suty, P. Habovcik and M. Tomaska, of the Slovak Technical University, Bratislava: "Fabrication and Properties of InP-InGaAsP Heterojunction Optoelectronic Devices"]

[Text] We developed InGaAsP films grown with liquid phase epitaxy. We measured and analyzed the properties of devices (lasers, photodiodes) made from these films.

Introduction

The article describes the development of optical sources (lasers and LED's) and the photodiodes of communications systems using optic fibers, turning attention to the technology for and properties of these devices. The advantage of these systems derives from the small junction loss and the minimal material scatter of the SiO_2 fibers in the wavelength range around 1.3 microns. Certain of their properties make the InP-InGaAsP quaternary heterojunction system very suitable for manufacture of optoelectronic devices operating in the 1.0 and 1.6 micron wavelength range. These quaternary systems permit independent variation of the width of the forbidden band and the lattice constant (Figure 1).

Matching the lattice of $In_{1-x}Ga_xAs_yP_{1-y}$ films to the InP substrate requires that y=2.2x (the thick broken line in Figure 1). It can be seen that the forbidden band energies extend almost continuously over a range 1extending from 0.75 eV to 1.35 eV (from 1.65 microns to 0.95 microns) in the case of an InP substrate.

Growth and Characterization of the InGaAsP Films

We grew InP and InGaAsP films with liquid phase epitaxy on a (100) orientation, n or p type InP substrate using the supercooling method. This method, which has the advantage of requiring only simple equipment, results in good quality films.

For the InP and InGaAsP quarternary films we used the customary multi-cell graphite vessel sliding horizontally. The composition of the active film of the $In_{1-x}Ga_xAs_yP_{1-y}$ LED laser was x=0.27 and y=0.59; this corresponds to a 0.95 eV forbidden band width at room temperature and the emission wavelength of the LED was 1.29 microns. The composition of the quarternary active film of the photodiode was x=0.33 and y=0.71. From this known solid state quaternary composition we calculated the liquid atom ratios. These were x^l_{Ga}=0.0086,

x^1_P=0.0023 and x^1_{As}=0.0499 in the case of $In_{0.73}Ga_{0.27}As_{0.59}P_{0.41}$ and x^1_{Ga}=0.0123, x^1_P=0.00143 and x^1_{As}=0.0547 in the case of $In_{0.67}Ga_{0.33}As_{0.71}P_{0.29}$.

The supercooling growth begins at 640 degrees Celsius and lasts for a few minutes with a cooling speed of 1 degree per minute to achieve the desired thickness with the grown film. We measured the relative error of lattice matching between the grown quaternary epitaxial layer and the substrate, the delta a/a, simultaneously with X-ray diffraction using CuK_{alpha} radiation, and it was better than 0.1 percent.

We estimated the forbidden band width of the InGaAsP epitaxial layers with optical transmission measurement.

Design and Manufacture of the Devices

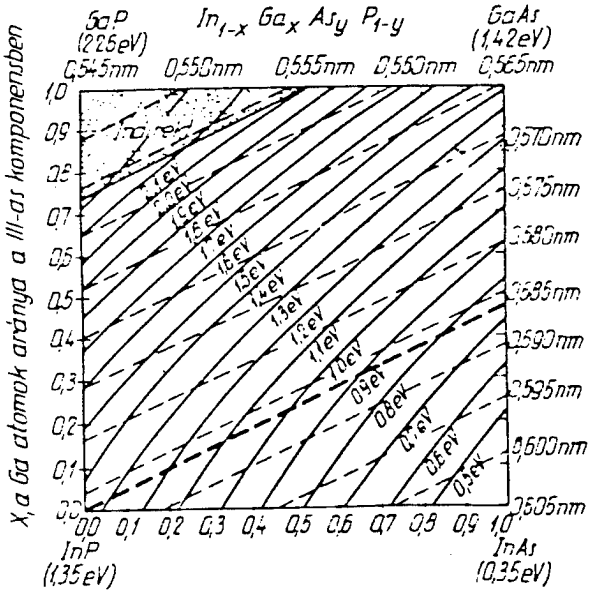

Figure 1. Changes in forbidden band and lattice constant in the case of $In_{1-x}Ga_xAs_yP_{1-y}$.

Figure 2 shows the outline structure of an edge radiating LED laser. First we vaporized Au-Zn-Ni onto the epitaxial surface. We used the standard photolithographic process to form the strips. We alloyed the metal for 3 minutes at 420 degrees Celsius. The proton insulation was done at room temperature using a $2x10^{15}$ cm^{-2} dose and enough energy to insulate a depth of about 1.5 microns. After thinning the substrate we vaporized an Ag-Sn contact onto the back side and alloyed it for 3 minutes at 460 degrees Celsius. After splitting we fastened the devices to a copper heating block

Figure 6 shows the structure of a photodiode made by mesamilling on a p type InP substrate. We made the photodiode with a separate absorbing (InGaAsP) and multiplying (InP) range. We formed an S=0.047 mm^2 diode area mesastructure with a wet photolithographic

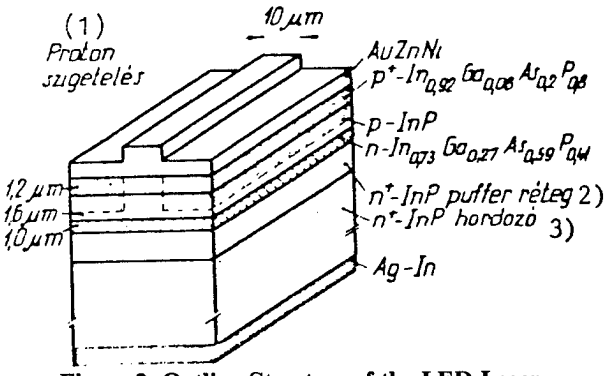

Figure 2. Outline Structure of the LED Laser

Key:
—1. Proton insulation
—2. Buffer film
—3. Substrate

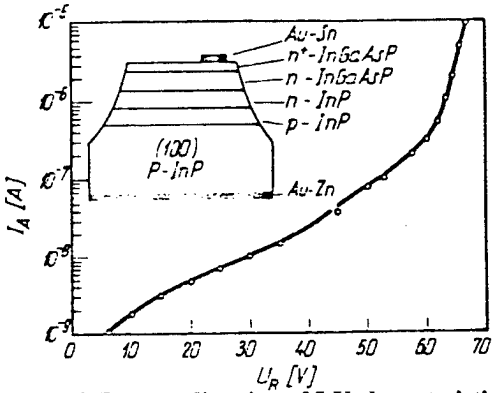

Figure 6. Reverse direction of I-V characteristic of the photodiode. [An inset shows the structure of the photodiode.]

process. Ohmic contacts were formed for the LED structure simply, without proton bombing.

Characteristics of the Devices

The dual heterostructure of an LED laser wafer consists of four films (Figure 2); the first film is n type InP (doped with Sn); the second is an undoped InGaAsP quaternary active region; the third is p type InP (doped with Zn); and the fourth is p^+ type InGaAsP quarternary to be used as an ohmic contact (strongly doped with Zn). We measured the characteristics after device fabrication. Figure 3 shows the spontaneous emission spectra of the LED diodes in the continuous operating mode. Figure 4 shows the I-V curves in the forward direction operating mode. The upper curve is the normal I-V curve of a 20 micron strip device. The lower curve is the I-V curve of a device completely insulated by protons (without a strip). A comparison of the two curves indicates the current flow-through on the strip.

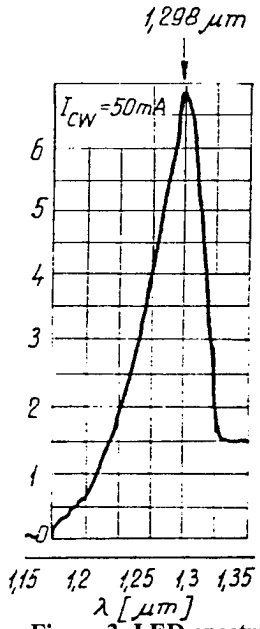

Figure 3. LED spectra.

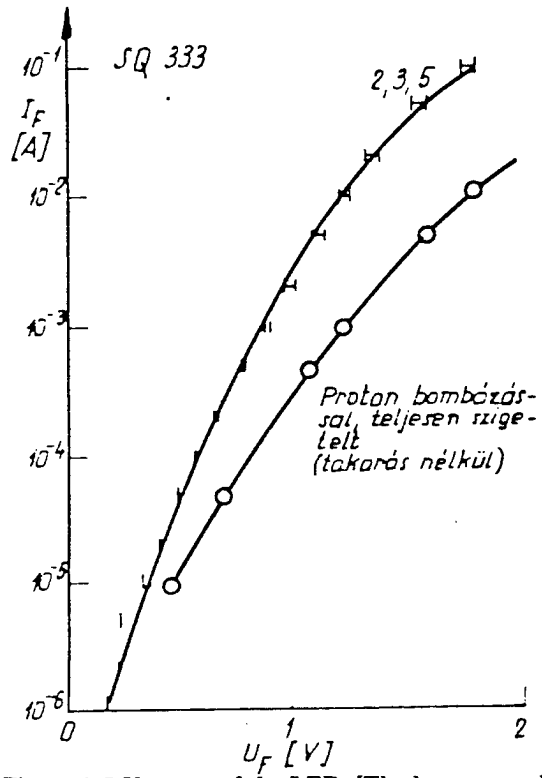

Figure 4. I-V curves of the LED. [The lower curve bears the note: "Completely insulated with proton bombardment (without covering)."]

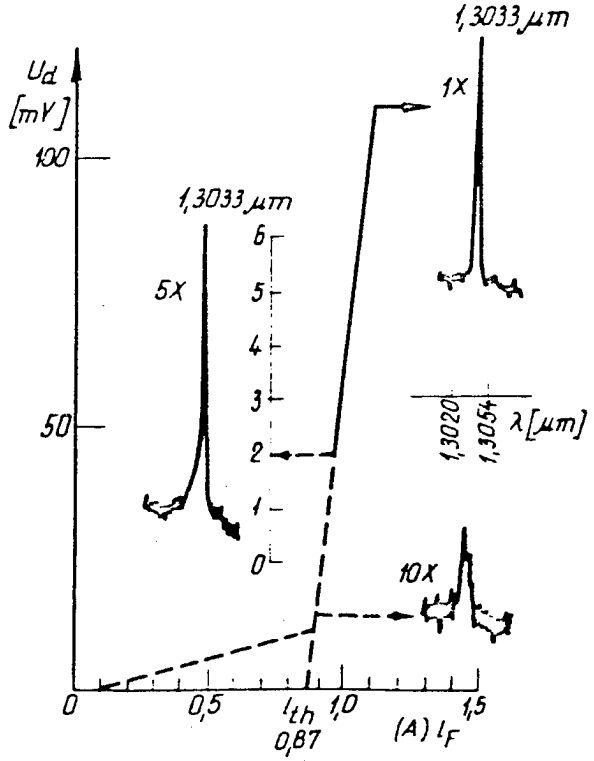

Figure 5. L-I curve and spectral response of the laser.

We measured the spectral response of the lasers with small space factor, high power pulses. The pulse repeat frequency was in the 0.1-10 kHz range, with 100 ns pulses. Figure 5 shows the measured L-I curve and the I_{th}=0.87 A threshold current at T=300 K. We measured the laser spectrum with a dual lattice GDM 1000 monochromator. One can see the mode change of the laser at various current conductions (Figure 5) and the better single mode operation at I=1.07 A.

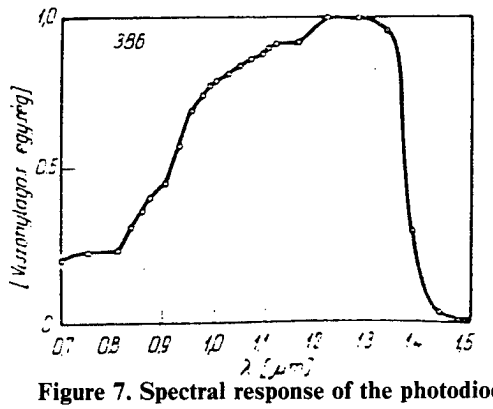

Figure 7. Spectral response of the photodiode.

The structure of the photodiode wafer (Figure 6) consists of a p type buffer film, a 2 micron thick multiplying n-InP film, a 2-3 micron thick absorbing n-InGaAsP film and an n^+-InGaAsP contact film. The concentration of the undoped films was in the range n=3 to 8 x 10^{15} cm^{-3}.

We achieved the purity of the undoped epitaxial films with long duration heating of the melts before epitaxial growth. After device fabrication we measured the reverse direction I-V characteristics (Figure 6) and the spectral response of the photodiode (Figure 7).

The parameters of the photodiodes, such as a dark current of 5 nA/10 V, a spectral response range of 1 to 1.35 microns and the 3 pF/15 V capacity of a 0.037 mm^2 area diode, are comparable with the published results.

To sum up, we developed InGaAsP heterojunction films grown with liquid phase epitaxy and we demonstrated the properties of InP-InGaAsP heterojunction optoelectronic devices.

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SCIENCE & TECHNOLOGY POLICY

Warsaw Dailies Give High Profile To Soviet S&T Fair

Soviet Official Rates Bloc S&T Cooperation

26020008a Warsaw RZECZPOSPOLITA in Polish 1 Oct 87 pp 1, 5

[Interview with Boris Tolstykh, Deputy Premier of USSR, conducted by Jadwiga Korzeniowska-Krasowska, date and place not given]

[Text] Polish-Soviet economic and scientific-technical cooperation is developing smoothly, as intended by both countries. Implementation of the concepts contained in the Long-Term Program for Development of Economic and Scientific-Technical Cooperation to the Year 2000 has made it possible to utilize intellectual and production potential more efficiently.

Boris Leont'yevich Tolstykh, deputy premier of the USSR, chairman of the State Committee on Science and Technology, doctor of technical sciences, and honored guest of the Soviet Science and Technology Fair in Poland, has granted an interview specially to RZECZPOSPOLITA.

[Question] The long-term program for development of economic and scientific-technical cooperation between Poland and the USSR has been in progress for 3 years now. This really is too brief a period for meeting all the criteria of the program, but it is not too early to speak of material results. In your opinion, Citizen Premier, what should be regarded as the most significant and promising results?

[Answer] In our cooperation with Poland, it is to be regarded as the most important fact in the current stage that scientists and scientific personnel have concerned themselves with the very significant topics representing the most important directions of development in science and technology. All that is needed is to take a look at the exhibits on display in Warsaw and Katowice, especially the ones illustrating our cooperation. We are concentrating on the most significant spheres of science and technology, on the most complicated processes, such as biotechnology, electronics applications, robotization, computer technology, medical technology, food science, etc.

An example of very good cooperation is provided by Polish printers (peripheral equipment), as for example, cooperation in production of the D-180 printer. Computers used in different applications and for different purposes have also made their appearance, ones for schools, personal computers, ones for social services, or systems for automation of various production processes.

Our cooperation also has a very human and humanitarian dimension, as, for example, cooperation in the area of medicine and production of foods. Note should also be taken of results in traditional areas such as self-propelled cranes, automatic welding machines, industrial robots, and motor vehicles. Joint development is going forward in a large number of directions.

[Question] All the socialist countries are engaging in scientific and technical cooperation. In your opinion, Citizen Premier, what progress is being made in accomplishment of tasks?

[Answer] We are satisfied with the results of this cooperation. The main priorities for scientific-technical progress and cooperation between the socialist countries are the processes mentioned earlier. They are currently assuming great intensity. Joint work is being undertaken on an ever larger scale, more and more joint projects are reaching the applications stage, and more and more products are reaching the mass production stage.

It is to be regarded as highly important in this cooperation that the teams of scientists and designers and the teams responsible for production are becoming accustomed to each other, are beginning to understand the deep meaning of this cooperation, are seeking joint solutions, and are making joint decisions.

Obviously there still are a large number of matters remaining to be resolved, such as questions of prices, currency, financial, and credit relationships, and the creation of joint funds. All this must be carefully thought over, but many questions have already been resolved. Exchange of information has now been improved.

[Question] The dynamics of cooperation in the area of science and technical progress makes it necessary to overcome a number of difficulties resulting primarily from the habits developed in years past. After all, we are learning new forms of operation adapted to present-day requirements.

[Answer] We are working together with the Polish side at the level of the Committees on Matters of Scientific and Technical Progress precisely to remove obstacles and to

create proper conditions for our cooperation. Similar work is in progress at the level of scientific institutes and production plants. At this juncture I should point out that the number of obstacles and disruptions has been significantly reduced. Only the most complicated questions remain, but the time will come when they too will be resolved.

I would like to say that enterprises in the USSR have been given maximum freedom and independence. Enterprise directors can sign contracts, perform services, and make decisions regarding the creation of joint groups, and even enterprises, independently, without approval by higher ranking organizations.

I must stress, however, that these are complex processes, and certain groups still have not made an effort to accustom themselves to this independence. A director may still act in the old manner despite the broad authority granted him. These questions are discussed in various meetings at directors' conferences. I was in Poland earlier this year, and on this occasion had the opportunity to participate in such a meeting. I am convinced that the questions were dealt with in a proper manner.

Such questions have been broached in the forum represented by the CEMA Comittee on Scientific and Technical Cooperation, where we try to work out the most advantageous solutions together. These problems are also brought up before organizations competent to solve specialized problems, such as matters relating to credit, finance, and prices. Such questions should be coordinated by way of bilateral and multilateral contacts.

[Question] As I have learned, your visit to Poland is not limited exclusively to participation in the official events associated with the Soviet Science and Technology Fair now being held in Poland.

[Answer] In addition to my duties assigned by protocol, such as opening the exhibit at the Palace of Culture and Learning in Warsaw on the achievements of Soviet science and technology, I am devoting considerable time to essential matters such as direct meetings with persons engaged in carrying out scientific and technical cooperation, my Polish colleagues in corresponding government agencies directing the development of science and technology. The most important matter at these meetings, as there is surely no need to explain to you, is overcoming the obstacles standing in the away of harmonious development of our cooperation, in effect in the way of working out a common viewpoint. We have established this procedure and follow it in our multilateral contacts.

There are many detailed questions which we must discuss in advance with a team from the Office of Scientific and Technical Progress and Applications. This is one of the important tasks facing our delegation. We have scheduled these meetings to see how the exchange of information is progressing, what the planning process is, etc. To tell the truth, no sooner did we get off the airplane than we started the scheduled detailed discussions.

[Question] Could you give us a few details, especially details of the problems dealt with by the people forging scientific and technical progress?

[Answer] There are, for example, problems of remuneration and providing incentives for innovators, in the form both of material and moral rewards. We have drawn up joint documents aimed at expanding the groups which have the most important achievements to their credit. During our previous visit we established the principles governing encouragement of creative effort by means of material and moral incentives (rewards, distinctions). We have already made certain determinations.

[Question] Scientific and technical progress cannot be made without practical applications, and so there is need for partnership by production plants. There is need for understanding of business, and this still is not always the case at the enterprise management level, especially in the area of independent action.

[Answer] As I pointed out earlier, the Soviet manager now has full authority for independent action. We have acted more radically in this sphere than have our Polish comrades. I can cite many instances in which one of our managers telephones a Polish colleague to tell him that he has signed a direct contract without asking anyone for approval and that he can sell a product or perform services on behalf of a Polish enterprise.

The Polish manager has also signed a contract, but has stipulated that his signature does not have full legal force. The Polish manager still must coordinate with the Ministry of Foreign Trade, since he can establish contact with a foreign partner only through this institution. In this respect your country still has a lot to do to catch up with us.

In our committee we have a table listing the powers of enterprise directors in all the socialist countries. It shows that the Soviet manager has the greatest independence at the present time. This independence is so great that not all managers have not yet managed to avail themselves of it. I am convinced that this mechanism will be running smoothly in the near future.

I realize that I have not touched on all the problems in our discussion, but as the saying goes, it is a long day from dawn to dusk. I hope that we will have time during this visit to discuss at least what has been scheduled with our Polish partners.

Messner, Szalajda Meet With Tolstykh

68020008b Warszaw TRYBUNA LUDU in Polish 2 Oct 87 p 7

[Unsigned article: "Meeting With Zbigniew Messner"]

[text] On 1 October, the chairman of the Council of Ministers, Zbiegniew Messner, received Boris Tolstykh, deputy chairman of the Council of Ministers of the USSR and chairman of the State Committee on Science and Technology, who is in Poland on the occasion of the USSR Science and Technology Fair.

The status of completion of the long-term Polish-Soviet integrated program for scientific and technical progress was discussed in the light of bilateral cooperation as a whole. The meeting was attended by Zbigniew Szalajda, deputy premier and chairman of the Committee on Questions of Science and Technical Progress under the Council of Ministers.

S&T Cooperation Protocol Signed

68020008c Warszaw TRYBUNA LUDU in Polish 2 Oct 87 p 7

[Unsigned article: "Expansion of Polish-Soviet Cooperation"]

[text] On 1 October, Zbigniew Szalajda, deputy premier and chairman of the Committee on Questions of Science and Technical Progress under the Council of Ministers, and Boris Tolstykh, deputy chairman of the Council of Ministers and chairman of the State Committee of the USSR on Science and Technology, signed a protocol in Warsaw of discussions on the subject of further expansion and increase in the efficiency of Polish-Soviet scientific and technical cooperation.

A favorable rating was given to the progress made in implementation of the long-term integrated Polish-Soviet program of scientific and technical progress. The significance of the new forms of cooperation was emphasized, including the direct operations of joint teams of scientists and specialists, laboratories, design offices, institutes, and enterprises for rapid achievement of scientific and technical progress in high technology areas.

Practical options for speeding up completion of the integrated program of scientific and technical progress of the CEMA member countries to the year 2000 were indicated. Particular attention has been devoted to the problem of developing cooperation in the area of microelectronics as a field of decisive importance in development of the national economy of the two countries.

Regulations were approved in the course of the discussions in the matter of remuneration for outstanding work in the sphere of science and technology done jointly by Polish and Soviet organizations.

Certain problems on which effective accomplishment of the cooperation program depend, including economic, financial, and legal problems, were also discussed.

Tolstykh Tours Wroclaw Electronics Plant

68020008d Warszaw TRYBUNA LUDU in Polish 2 Oct 87 p 7

[Unsigned article: "A Visit to Wroclaw"]

[text] Borys Tolstykh was a guest in Wroclaw on 1 October 1987. He visited the Elwro Electronic Plant in Wroclaw, one of the largest makers of computer systems in Poland. The president of the Elwro Plant, Andrzej Musielak, informed his guest of the favorable progress of cooperation with Soviet designers and specialists in the area of information systems development.

Tolstykh then visited the Dolmel Lower Silesian Electric Machine Manufacturing Plant in Wroclaw, where he familiarized himself with the production of turbogenerators. During his meeting with the management of Dolmel, the president, Jan Romanowicz, recapitulated the results of more than 30 years of cooperation in turbogenerator manufacture with the Elektrosila plant in Leningrad, as well as the favorable results of cooperation with the Nevz plant in Novocherkassk in the area of electric traction.

During his visit to the production departments of Dolmen, B. Tolstykh displayed interest among other things in the highly advanced state of work on construction of the first 500-megawatt turbogenerator for the first Polish nuclear power plant in Zarnowiec.

Messner Tours Soviet S&T Exhibit in Katowice

68020008e Warszaw RZECZPOSPOLITA in Polish 3-4 Oct 87 p 1

[Unsigned article: "Successful Presentation of Achievements"]

[text] The USSR Science and Technology Fair is in progress.

The exhibit of Soviet scientific and technical achievements in Katowice was toured on Friday, 2 October, by the chairman of the Council of Ministers, Zbigniew Messner.

He was shown around the exhibit, which is situated in the technical progress center and covers an area of 10,000 square meters, by the deputy chairman of the State Committee on Science and Technology of the USSR, Mikhail Kruglov.

The premier inspected the most important sections of the exhibit representative of the accomplishments of the CEMA countries in fuel and power engineering management, machinebuilding, and utilization of the latest

technologies, in environmental protection, transportation, and peaceful uses of 30 years of Soviet space research in communications, metallurgy, geology, geodesy, agriculture, and forestry.

He displayed particular interest in nuclear power plant equipment, thanks to which the share of nuclear power plants in total energy production in the USSR will increase by a factor of 5 to 7 by the end of this century, in modern assemblies for working coal beds of varying thickness and degree of inclination, and equipment for remote control of machines in operation in coal seams. He listened attentively to explanations by Soviet specialists demonstrating, among other things, hydraulic equipment for repair of railway subgrades and mockups of the Transprogress pneumatic pipeline transportation system.

When signing the visitors' book, Z. Messner expressed his appreciation and thanks to the organizers of the exhibit and stated his conviction that it plays a significant informative function, in that the exhibit indicates both the capabilities of Soviet industry and the levels of cooperation with Polish industry.

Color TV Cooperation Plans

68020008f Warszaw RZECZPOSPOLITA in Polish 3-4 Oct 87 p 1,2

[Unsigned article: "B. Tolstykh At The WZT"]

[text] Deputy premier Boris Tolstykh, chairman of the USSR State Committee on Science and Technology, currently on a visit to Poland, toured the WZT [Warsaw Television Plant] on 2 October.

The progress of cooperation between WZT and the Soviet Elektron Association in L'vov was discussed during his meeting with the plant management. As we know, these two plants are jointly carrying out one of the priority tasks of the Polish-Soviet scientific partnership, modernization of color television production in Poland and the USSR, along with ultimate initiation of production of a jointly designed television receiver of a new generation based on digital technology.

The Soviet deputy premier evinced detailed interest in the status of design work on this device and in the progress made in unification of the units employed in television sets currently made by the WZT and Elektron. He appealed for frank disclosure of all obstacles and difficulties in effective cooperation between the two factories.

As was reported by the WZT's technical director, Eugeniusz Walczak, the plant currently produces black-and-white table-model and portable television sets (more than 20,000 such sets are exported to capitalist countries each year) and the Helios color sets. Improved Helios sets of the PAL/SECAM type will come off the assembly line in the near future. The production plans for this year also call for start-up of production of a new color television, the Syriusz, and the Vesta 14-inch portable color television set. The Syriusz will be a product of the first stage (1988-1989) of cooperation with its Soviet partner. It will have, among other things, a remote control unit made by the Elektron plant. This receiver will be gradually improved and new functions will be added to it. At the next meeting in L'vov, specialists of the two plants will draw up a list of unified subassemblies needed during the first stage of cooperation and will determine needs in the area of development and exchange of control and measurement devices and technological equipment. Production of the jointly developed new-generation television (so-called "digital television"), for which appropriate stocks of subassemblies are being created today, will begin during the next stage.

The director of the Elektron Association, Viktor Rybynok, in turned called attention to the difficulties encountered in delivery flow management, inasmuch as the volume of the Soviet partner's output is many times greater than that of WZT. In this connection consideration will be given to the possibility of including other Polish electronics sector enterprises in Polish-Soviet cooperation, among others Unimor in Gdansk, which is Poland's second ranking manufacturter of color television sets.

The questions of product quality and the methods used to improve this quality came up repeatedly in the discussions. The accomplishments of the WZT in this area were acknowledged. WZT vice-president Marek Kloczko stated that "we have worked out a special program on tape which makes it possible to find many latent defects in sets during the production phase. As a result, we make good television sets, even if the subassemblies are not always the best. If we pool our efforts in this area with our Soviet partner, we will be able to assure very high quality for our products."

The Soviet deputy premier shared his observations following a tour of some of WZT's production departments. Referring to the large number of assembly stations shut down because of a shortage of subassemblies, B. Tolstykh stated among other things that a major weak point of the electronics industries, not just in Poland and the USSR but in other CEMA countries as well, is insufficient production of semiconductor materials and subassemblies. "We in the USSR decided first to double, and then to quadruple this production," he said, "but it seems that this still is not enough to meet needs. I believe that each of our countries should exert the maximum effort to develop this area, inasmuch as it will affect our economic and social development." Encouraging the managements of the two factories to continue their efficient cooperation, the Soviet deputy premier promised all-round assistance in removing all obstacles and snags.

Soviets Show Off New Materials Advances

68020008g Warszaw RZECZPOSPOLITA in Polish 3-4 Oct 87 p 2

[Article by Korz.: "New Substances And Materials"]

[Text] Soviet achievements in the area of new materials and substances were presented on 2 October at the exhibit in the Palace of Culture and Science in Warsaw.

The chemical industry is one area of long-term cooperation in which much experience has been gained in direct cooperation. Fuller use of the potential of materials, primarily modern structural materials based on new chemical compounds and substances, is one of the important ways of modernizing the economy. A press conference held on 2 October was devoted to questions of modern materials and Polish-Soviet cooperation in this sphere.

For years now scientists of both countries have been engaged in intensive research on creation of new materials, which represent one of the determinants of scientific and technical progress. Cooperation in this area has a history dating back many years, but has become especially dynamic in recent ones, especially the last 2 years, because we have entered a period of intensified direct contacts between individual scientific institutes and scientific research and development centers. For example, a major installation for production of a substance of unusual importance to electronics is being built in Poland as a result of joint effort. Soviet capital has been contributed to the building of a plant in Tarnow for production of a so-called polarization initiator. Construction of a major industrial plant which will make chemical equipment for our countries is nearing completion in Opole. Soviet capital has been invested in a plant under construction also in Tarnow for the production of cyanogen chloride, an important component of dyestuffs, plant protection agents, etc. It should also be mentioned that an agreement has now been signed on establishment of a joint enterprise, the Miracullum, in Krakow.

Contacts between individual scientific research establishments have become very active. Extremely great value is attached to direct cooperation between the Institute of Industrial Chemistry in Warsaw and the Scientific Production Center in Moscow concentrating among other things on modern polycarbon structural materials. Our institute cooperates with the Ukrainian Plastics Institute in Donetsk in the area of new types of epoxy resins for electronic requirements. These are only selected examples.

Synthetic polymer substances have earned themselves a permanent place in economic applications, and they continue to advance, in that scientific laboratories are synthesizing new high-molecular compounds for creation of elastomers, plastics, and mechanically strong nonflammable fibers with increased thermal stability, along with polymers for medical purposes. Thanks to progress in industrial chemistry, the paint and varnish industry has had added to it a new high class of totally oil-free coating agents, automotive varnishes and enamels, and varnishes and enamels for applications in the machinebuilding industry and for household appliances. These enamels are characterized by high gloss, elasticity, high impact resistance, and resistance to the action of atmospheric factors.

These obviously are only selected examples of the directions of development of new materials in the chemical sector. Wide application of these materials marks revolutionary changes in engineering and technology.

Soviet Gains In High-Grade Steels, Metalworking, Autoelectronics

68020008h Warszaw RZECZPOSPOLITA in Polish 3-4 Oct 87 p 2

[Article by MT: "Cooperation In The Machine Industry"

[text] Friday was a regular "sector day" at the Exhibit of Achievements in Soviet Science and Technology in Katowice. At a special symposium, the Soviet guests presented among other things the latest Soviet achievements in production of high-grade structural steel used in outfitting the nuclear power plants built by the CEMA countries and in foundry practice and forming of sheet metal products, and trends in development of automotive electric equipment.

At both the symposium and the press conference, much attention was also devoted to Polish-Soviet cooperation in construction of machine tools and hydraulic self-propelled cranes.

Machine tool building is one of the sectors of industry in which Polish-Soviet cooperation is progressing very favorably. Tangible proof is provided by the increase in reciprocal deliveries of tools and equipment. It should be pointed out that in recent years this cooperation has increasingly moved from the area of ordinary reciprocal deliveries to that of joint work to develop new and improved products and to improve product quality.

Biotechnology Collaboration With Soviets

68020008i Warszaw RZECZPOSPOLITA in Polish 6 Oct 87 pp 1,2

[Article by FOR.: "USSR Science and Technology Fair: Biotechnology For Man"]

[text] New preparations in medicine and agriculture; Polish and Soviet Scientists collaborate.

The theme at the USSR Science and Technology Fair on this day was "biotechnology for man." The event, in which representatives of Polish and Soviet science took part, was organized by the Ministry of Agriculture, Forestry, and Food Economy. Dr M. A. Bulyginskaya,

biological sciences candidate V. V. Kalugin, and Academician P. V. Petrov participated in the event, presenting the accomplishments of Soviet scientists in this sphere.

Academician P. V. Petrov, acting director of the Immunology Institute, stated that "biotechnology currently is one of the priority directions of scientific and technical progress. Practical steps to provide man with a greater amount of food and to protect him from various diseases are increasingly associated with this field of science."

Genetic engineering methods have enabled Soviet scientists to isolate the human growth hormone and introduce it into microorganisms. This results in production of a microorganism synthesizing the human growth hormone in amounts allowing industrial production of the hormone for medical and other purposes. Production of unlimited amounts of this hormone creates the prospect of increased livestock production in agriculture. This is only one of the examples.

A large-scale integrated research program in biotechnology concerns the fields of medicine, agriculture, and industry. Some of the results of this research were presented at the exhibit of Soviet scientific and technological achievements. These advances include new livestock feed and medicinal preparations, plant protection agents, microbiological production equipment, the new spring wheat varieties Istok and Odesskiy-115, and rice containing valuable economic substances.

In 1985 Poland and the Soviet Union signed an agreement on cooperation in biotechnology. Improvement in the resistance and reproduction by cloning of a number of valuable farm crops, including sugar beets and grapes, and decorative flowers, are scheduled to be carried out by 1990. Scientists of the Fermentation Industry Institute collaborate daily with personnel of the Food Industry Institute and the Dairy Institute in Moscow. Even now non-alcoholic beverages and dietetic products for the sick have been made available on the market, and work is in progress on methods of storing beets. These are all biotechnological developments.

Soviets Present Papers On Controlled Nuclear Fusion

68020008j Warszaw RZECZPOSPOLITA in Polish 6 Oct 87 pp 1,2

[Article by MT: "Mining And Power Engineering in Katowice"

[text] Monday, 5 October, at the Exhibit of Soviet Scientific and Technological Achievements was devoted to topics of immediate interest to the inhabitants of this area, mining and power engineering. The importance of this sector to the Soviet economy is attested by the fact that in 1986 the Soviet mining industry extracted 751 million tons of coal, and the output will increase to 780-800 million tons by 1990.

During the Monday symposium, in which Polish specialists participated, scientific personnel of Soviet institutes of the Ministry of the Coal Industry of the USSR presented papers devoted chiefly to the latest achievements in the area of controlled thermonuclear synthesis, the main direction of scientific and technical progress of the coal industry, and labor safety in Soviet mines.

Outlook For Improved S&T Cooperation

68020008k Warszaw RZECZPOSPOLITA in Polish 8 Oct 87 pp 1,4

[Article by MT: "Electronics And Automation"]

[text] Electronics and automation, new technologies and materials, nuclear power engineering and biotechnology, along with restructuring the machinebuilding industry and production of consumer goods of the highest quality, represent the main areas of scientific and technical cooperation between Poland and the USSR to the year 2000.

The "Day of Friendship and Cooperation" organized on 7 October at the Exhibit of Soviet Scientific and Technological Achievements in Katowice was devoted to the problems of this cooperation, and especially the forms it assumes, such as industrial cooperation, joint enterprises, coordinating councils, and teams of scientists.

As Igor' G. Ushkalov, scientific associate of the Institute of World Economy of the Socialist System, pointed out at the press conference, "If we want to be successful in carrying out the long-term cooperation program, we cannot confine ourselves exclusively to the old, well-tested methods; there must be full implementation of the new mechanisms of socialist cooperation. There is no lack of examples today of mutually advantageous cooperation filled with new content and in harmony with the spirit and needs of our days. Nearly 280 agreements have now been signed on direct cooperation between Soviet and Polish enterprises; 12 joint enterprises are being established, 10 of them in Poland, and 20 joint scientific research teams are at work on the most important problems of scientific and technical development relating, for example, to digital and satellite television, a Diesel engine, etc. The point is that these new and progressive forms of cooperation have promptly set the tone for Soviet-Polish economic relations."

The main event on the Day of Friendship and Scientific and Technical Cooperation, which was organized by the provincial administration of the Society for Polish-Soviet Friendship and the provincial council of the Chief Technical Organization in Katowice, was a symposium at which the engineering and technical personnel of enterprises and research establishments of the region listened to presentation of papers devoted to Polish-Soviet cooperation in science and technology. At this

event, the outstanding organizers of the exhibit, on both the Polish and the Soviet sides, were decorated with gold honorary badges of the Society for Polish-Soviet Friendship

Dependence on Western Medical Technology

68020008k Warszaw RZECZPOSPOLITA in Polish 8 Oct 87 p 4

[Article by Jota: "Health Protection"]

[text] The condition and state of Soviet medicine were discussed on 7 October at the Ministry of Health, at a press conference attended by scientists participating in the USSR Science and Technology Fair.

"We have been cooperating for 20 years now," stated professor A. P. Ramadanov, director of the Institute of Neurosurgery. "I believe that it has been very fruitful. We and our Polish colleagues have jointly published more than 200 scientific articles. We have organized many international symposia in which scientists from all over the world have participated. An enormous role is assigned to health protection in our countries. However, the new situation requires a new approach to many problems. We in the USSR are currently considering how to make the soundest use of the 1.5 billion rubles annually allocated for health service needs. At the same time, the ruble, like the zloty, is not being used to buy what we need. I believe that we must make ourselves independent of imports of medical equipment from the dollar zone. We must begin manufacturing medical equipment in our own area, within the framework of CEMA. This equipment must be competitive with that produced in the West, and this problem must be solved so that the solution will be advantageous to all parties."

Rational use of medical equipment was also discussed by Prof V. I. Petrov, corresponding member of the Academy of Medical Sciences and rector of the Moscow Medical Institute. He stated that "progess in the medical sciences over the last several decades is due chiefly to progress in diagnostic techniques. Unfortunately, not every hospital or institute can procure costly instrumentation. Consequently, we must establish modern diagnostic centers with broad capabilities. Approximately 50 to 60 of them are to be set up in the USSR, the first 5 of them in 1988. Hospitals and the open health service will avail themselves of these republic-level or regional centers."

The conference was conducted by the deputy minister of health and social welfare, Prof Jerzy Bonczak.

Soviets Show Films On S&T Advances

68020008l Warszaw RZECZPOSPOLITA in Polish 8 Oct 87 pp 4

[Article by REG: "Scientific And Technical Films Screened"

[text] Soviet scientific and technical films familiarizing those interested with the contemporary problems and latest trends in scientific research will be screened from 8 to 10 October at the Technical Progress Center in Katowice, as part of the USSR Science and Technology Fair.

New technologies in the machinebuilding industry, original concepts, solution of problems in power engineering and biotechnology and the requirements set for environmental protection and investigation of the mysteries of life are matters which should be of interest not just to specialists but to all persons who simply would like to learn more of what they need for professional reasons.

No More Intermediaries In S&T Cooperation

68020008m Warszaw RZECZPOSPOLITA in Polish 10-11 Oct 87 pp 1,6

[Article by BRZ: "No More Intermediaries"]

[text] A meeting of activists of the Polish-Soviet Friendship Society, the Chief Technical Organization, and the Polish Economic Society and representatives of ministerial departments which have for many years been cooperating in the area of scientific and technical problems with corresponding scientific establishments, social organizations, and institutions in the USSR, was held on 9 October at the Polish-Soviet Friendship House in Warsaw.

As Prof Henryk Bednarski pointed out in his address, scientific and technical cooperation between our countries entered a new stage following the signing a year ago of an agreement defining the principles of this cooperation. This agreement is an instrument creating the possibility of direct cooperation between enterprises, institutions, scientific research units, and associations. It places the entire process on a basis of objective activity, exchange of scientific and technical thought, licenses, and technological documentation, and also of mutual performance of services.

Minister Konrad Tott stated among other things that, in accordance with the determinations of the Polish-Soviet intergovernmental commission on economic and scientific-technical cooperation, the science and technology offices have given close consideration in selection of tasks to the possibility of carrying out these tasks on the basis of direct cooperation.

The meeting was attended by the deputy chairman of the USSR State Committee on Science and Technology, Viktor Yezhkov, and on the Polish side by ministers Stanislaw Zieba, Janusz Maciejewicz, and Jerzy Majewski.

Soviets Host Symposium oN Environmental Protection Technology

68020008n Warszaw RZECZPOSPOLITA in Polish 10-11 Oct 87 p 6

[Article by MT: "Environmental Protection"

[text] The Environmental Protection Day celebrated on Friday, 9 October, at the Exhibit of Soviet Scientific and Technological Achievements in Katowice was devoted to problems associated with detecting, evaluating, and forecasting the impact of pollution on various natural features, and especially to methods of counteracting these unfavorable phenomena.

During the symposium, whose chairman was Prof Stefan Jarzebski, minister of environmental and natural resource protection, Soviet and Polish specialists presented accomplishments in bilateral cooperation in the area of environmental protection, including in particular such accomplishments in industrial application of waste-free technologies, in the coke by-product industry, and in development of pollution monitoring and control services. It was announced, among other things, that the regular air quality monitoring conducted in 476 Soviet towns and cities proves that in recent years pollution of the air by dust, sulfur dioxide, and carbon monoxide has been reduced 13 percent.

The exhibits in pavilion 10 of the Technical Progress Center correspond to the topics of the "sector day" at the recent exhibit in Katowice. They include, among others, the most recent models of instruments for monitoring the condition of air and water, models of filters and equipment for cleaning gases discharged into the atmosphere, gas cooling systems, and industrial dust absorbers. The models of waste treatment equipment on exhibit are also characterized by high performance features. The large number of exhibits illustrate the work in progress in the USSR for protecting soils from erosion by wind, water, and drought, and from pollution with industrial and municipal waste.

Friendship Society Boosts S&T Cooperation

68020008o Warszaw TRYBUNA LUDU in Polish 10-11 Oct 87 p 4

[Article by SOW: "A Common Workshop Breeds Friendship"]

[text]During the USSR Science and Technology Fair in Poland, talk about cooperation between Poland and the USSR was couched in specific terms.

Many examples can be given of the cooperation and of its results. They also came up during the meeting held on the occasion of the Day of Polish-Soviet Friendship and Scientific-Technical Cooperation organized on 9 October in Warsaw by the Central Administration and the Capital Administration of the Polish-Soviet Friendship Society.

"We try to be present wherever Polish-Soviet cooperation initiatives are generated, and we often inspire them ourselves," stated Henryk Bednarski, PZPR Central Committee secretary and head of the Central Administration of the Polish-Soviet Friendship Society. "After all, the idea of organizing clubs of exporters to the USSR arose in the Polish-Soviet Friendship Society. An event of outstanding significance such as the fair now in progress is an occasion both for presenting the accomplishments of Soviet scientific and technical thought and for direct meetings."

"We attach great importance to direct contacts not just between institutes, economic organizations, and plants in Poland and the Soviet Union, but above all between specific persons," stated Bednarski. Nothing contributes so much to strengthening friendship as mutual acquaintance of people at work, in a common scientific or production shop."

According to Konrad Tott, minister and director of the Office Scientific and Technical Progress and Industrial Applications, work has been done this year on precise definition and amplification of the subject matter of the program of scientific and technical cooperation between Poland and the USSR. Specific deadlines have been set for completing research and development work, developing equipment and technology prototypes, and application of the anticipated future results.

The deputy chairman of the Committee on Science and Technology of the USSR, Vladimir Yezhkov, dealt with this matter in his address. "One of the chief directions of the restructuring currently in progress in the Soviet Union is making scientific and technical progress the main factor in economic development of the country. The cooperation among the socialist countries contributes to acceleration of progress."

At the end of the meeting, the chairman of the Central Administration of the Polish-Soviet Friendship Society, Henryk Bednarski, presented honorary gold badges of the Polish-Soviet Friendship Society to meritorious workers.

Soviet S&T Fair Closes

68020008p Warszaw RZECZPOSPOLITA in Polish 13 Oct 87 p 1

[Polish Press Agency report: "Close Of USSR Science And Technology Fair In Poland: Successes In Research And Engineering"

[text] The USSR Science and Technology Fair in Poland closed on 12 October. The accomplishments of Soviet scientists and engineers in many areas of research and technology had been presented over a span of 2 weeks. It was an occasion for Polish society at large to acquaint itself with the latest and most important achievements of Soviet science and technology, and also with the results of Polish-Soviet cooperation in this area.

The fair was organized in connection with the 40th anniversary of the signing of the first agreement on scientific and technical cooperation between Poland and the Soviet Union.

Research and engineering achievements were presented in two exhibits, one in Warsaw and the other in Katowice, which were open to visitors simultaneously and which covered the subjects of electronics, nuclear physics, automation, biotechnology, new materials, health protection and medical equipment, and space research.

The exhibits in Warsaw and Katowice were visited by a total of more than 500,000 persons.

Editorial On Fair's Accomplishments

68020008q Warszaw TRYBUNA LUDU in Polish 13 Oct 87 p 3

[Article by B. M.: "2 Weeks of Soviet Science and Technology—New Contacts, Friendships, Topics"]

[text] The 2-week encounter with Soviet science and technology was a highly successful event. This was the unanimous opinion of the guests who traveled to Poland for this period, the sponsors organizing the USSR Science and Technology Fair, and the very great number of participants. Huge throngs of visitors made their way through the exhibit rooms in Warsaw and Katowice each day. Great interest was displayed among Polish scientists and specialists in the so-called sector days, on which there were lively discussions in connection with the scientific papers presented by the guests. In short, the goals which had been set for the fair from the outset were reached. In addition to wide publicity for the achievements of Soviet science and presentation of the results of our cooperation, the event became a nucleus for new contacts between scientists and specialists, new friendships, and new topics.

The chairman of the State Committee on Science and Technology of the USSR, deputy premier Boris Tolstykh, who sponsored the fair along with deputy premier Zbigniew Szalajda, when asked for a brief comment to appear in TRYBUNA LUDU, stressed among other things that he came away from encounters in the workplace with the conviction that there is great interest in cooperation. "The enterprises which we visited are good plants employing highly skilled personnel," said our guest, stating emphatically that the reform in progress in Poland is regularly solving many problems.

When asked about the new rules of cooperation and the difficulties that have not yet been eliminated, deputy premier Tolstykh stated that the main stumbling block is the psychological barrier. He referred here to the direct contacts between research establishments, stating that from the formal viewpoint the matter has been settled; personal contacts have been established, but not everyone feels comfortable as yet under the conditions of autonomy. Another problem area is represented by the questions associated with the credit and financing plans and price setting. This as well is a subjective problem. Everything is now based on principles different from those applied for years. We are shifting from joint research to cooperation, from exchange of services in the context of scientific and technical cooperation to starting up production, marketing, and servicing. These are entirely new forms. We must actively train personnel for these new tasks and exchange experience in theoretical and practical fields. "I believe," vice premier Boris Tolstykh stated in conclusion, "that we have enough scientists and specialists in Poland and the Soviet Union to solve all problems at a decidedly faster pace."

Scientists on both sides have spoken out about the favorable changes and the direct contacts which avoid commissions or working groups of all kinds. We have written about them in our current reports. We have also written about the difficulties, which we have not concealed, not just because the era of perestroyka and renewal rejects any attempts at passing over in silence things which have not yet come out right. In research, as for that matter in every activity (and perhaps even more so), mutual information about weaknesses is the basis for rapidly overcoming such weaknesses.

We will dispense with a detailed summing up. After all, a brief commentary is not the most appropriate place for one. One thing should be stressed again, however, that is, that the event was successful and useful and that it took place in a creative, friendly atmosphere. At many points it threw additional light on the path of our cooperation in science, engineering, and technology with the Soviet Union, partner number one in Poland's contacts with the world. These are also significant pluses which should be posted to the credit of the fair.

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AEROSPACE, CIVIL AVIATION

Brazil's New Aerospace Lab Described

36990035 Rio de Janeiro O GLOBO in Portuguese 2 Dec 87 p 6

[Text] Sao Jose dos Campos - This afternoon, President Jose Sarney will inaugurate the Assembly and Testing Laboratory, (LIT), the most sophisticated testing laboratory in Latin America, and one of the world's five most complete. This will be the official inauguration since the facility—which belongs to the National Institute of Space Research, INPE—has been functioning at 30 percent capacity since September. During the ceremony, the president will announce that he has signed a decree granting salary increases of 39 to 43 percent for technicians and scientists who work for INPE and for the Aerospace Technology Center, (CTA).

The president will arrive in Sao Jose dos Campos at about 1500. As soon as he arrives at INPE, Sarney will view a film on the institute and the Brazilian space program. He will hear speeches by Marco Antonio Raupp, director general of INPE, and Luiz Henrique, minister of science and technology. Then, wearing special clothing, the president will enter the facilities known as "clean rooms," special areas used for testing electromagnetic compatibility, where conditions of temperature, pressure, humidity and air purity are completely controlled by computers.

It is in these rooms that INPE will begin conducting tests on some of the electronic components of the first Brazilian satellite, a meteorological data collecting platform that is to be launched into space within the next two years. The installation also contains computerized equipment and systems that can be used to calibrate the testing instruments; these have already enabled the laboratory to perform services for Embraer—testing aircraft systems—and Avibras, testing platforms for inertial navigators. The laboratory's instruments can be used to test aircraft, missiles, as well as electronic systems for automobiles, computers, and many other types of machinery.

The laboratory cost about $30 million (19.07 billion cruzados) and its primary purpose is to permit the integration of testing systems with the Brazilian satellites now being developed at INPE. As part of today's inauguration ceremony, President Sarney will activate the system that commands one of those tests—the vacuum chamber that simulates the environment in which the vehicle will operate in space at an altitude of 700 km. The structure of the satellite has already passed these tests. Now it will be subjected to tests that simulate the movements, pressures, and stresses to which the satellite will be submitted while being transported to the launch site at Alcantara, Maranhao State and during the installation of the rocket nose cone, the launch itself, travel in space, and final separation from the rocket.

The assembly and testing laboratory will be one more resource that Brazil will make available to Latin American countries which have space programs. Argentina, for example, is slowly developing a scientific applications satellite, (SAC), intended to do research into sunspots and solar energy. A group of Brazilian researchers will participate in the project, and it was agreed early on that the Argentine satellite would be assembled and tested at LIT. Several other countries have already expressed interest in this type of technical cooperation.

Until next year, the Brazilian scientists will receive technical advice from Interspace, a company associated with the French Aeroespatiale, but INPE realizes that it could be very difficult to renew that agreement because of the technological embargoes set up by the Big Seven against developing countries that are conducting nuclear programs, or medium or long-range rocket or missile programs.

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BIOTECHNOLOGY

Some Biotechnological R&D in Argentina

36990008b Buenos Aires ARGENTINA TECHNOLOGICA in Spanish Aug 87 pp 46-49

[Article by Jose Hector Fernandez Conti: "Biotechnology and Farming and Livestock Production - Seminar on Biotechnology and Livestock Production (New York)"; first paragraph is ARGENTINA TECHNOLOGICA introduction]

[Excerpts] Meetings of particular importance were held recently in New York and Sao Paolo, organized by the Banco de la Provincia de Buenos Aires. Argentine authorities, accompanied by a numerous representation of producers, industrialists, and scientists concerned with the development of biotechnology in our country met, throughout a number of long workdays, with their respective U.S. and Brazilian counterparts. Both meetings generated an original debate and exchanges of views on a varied range of topics related to the research, use, and commercialization of goods stemming from in the application of biotechnology on the farm, both as regards agricultural production and animal husbandry. The combined reporting of the New York meeting was headed by Jose Hector Fernandez Conti.

Inaugurating the proceedings of this seminar, the governor of the Province of Buenos Aires, Dr Alejandro Armendariz, referred to the decisive role being played by contemporary science as it interprets and gives form to the world in which we live. "It is the result of a succession of accomplishments, advances and discoveries without parallel in the history of the goals attained by the human race." He added that modern science is changing our view of the universe and our conception of what we call reality.

"The theory of relativity, quantum physics, and molecular biology have replaced ancient theories, and astrophysics has opened cosmic vistas that a generation ago could not even be dreamed of."

Ethics and Responsibility

The undersecretary for livestock, engineer Valerga, for his part, indicated that "Without doubt, this opportunity we now have to be a part of this era, to participate in the advance of genetics, and in this way to acquire a high level of knowledge of living beings, and even the potential for creating new forms of life, both vegetal and animal, clearly imposes on us a sense of ethics and of responsibility different from that which scientific research has perhaps had traditionally."

Research Agreements

Addressing the topic of Argentine scientific institutions in genetic engineering and their ties with the productive system, Dr Hector Torres, dean of the UBA's College of Exact and Natural Sciences, noted that "Research in the health sector is better than in the food and energy sectors. This is understandable," he said, "since research in biomedical science is a tradition in Argentina. Diagnostics, pharmaceutical products, and animal vaccines are distinguished rubrics." He stated that "In biotechnology research in Argentina, various institutes are pursuing activities in different fields related to the topic. These institutes also participate in the training of graduates. Vegetal molecular research is now a new and very active field of research, in which four solid groups are now working. Private industry is devoting resources to the biotechnological sector, and CONICET is organizing an interfacing structure to define relationships between the research institutes and industry. More than 100 agreements have been signed by way of this structure."

Distinguished Research

Dr Juan Dellacha, chairman of the Biological Chemistry Department of the UBA's College of Pharmacy and Biochemistry, discussed the subject of Argentine research on structures and purification of somatotropic hormones, pointing out that the college's laboratory was the first to in any way combat the dogma that existed with respect to the growth hormones. "It was thought that the mammalian one did not act upon human beings because of its larger size. The reality is totally different. In size, they are all equal, the human as well as those of non-human animal origin." Between 1966 and 1985, his work group prepared human growth hormone for the treatment of children with growth disturbances, which was administered free of charge in the Buenos Aires Children's Hospital, where 70 children affected by severe growth disturbances underwent treatment.

"That is to say," he pointed out, "that during the mentioned period, 45,000 doses were prepared. And in recognition of the fact that our laboratory is 1 of the 5 centers that prepared growth hormone, we participated, together with the National Scientific Agency of the United States and other centers in England, Sweden, France, and Norway, plus 10 others, in a joint study that, in 1984, enabled the World Health Organization to establish the first international standard for the growth hormone.

Back to the Laboratory

Dr Jose Latorre, director of the CONICET Center for Animal Virology, recommended against merely stopping at the threshold of future biotechnological prospects, and referred to the biomolecular aspect of the hoof-and-mouth disease virus and to the potential for developing new vaccines. He pointed out "the need to address the problem of antivirals, problems of structure of the receptor, and to develop antibodies that will affect the receptor, preventing the virus from binding to it." He stressed that "these approaches must be made through a very detailed knowledge of the molecular structure, which is the direction in which our present research must be channeled. We must go back to the laboratory," he stressed, "and study in depth to be able to define the structure we seek."

Cutting-Edge Technology

Lawyer Marcelo Arguelles, president of BioSidus, spoke on the production of recombinant DNA biomolecules, with reference to Argentine work in this regard, indicating that "The country has in its scientific and technical substrate the potential for undertaking cutting-edge technology such as biotechnology. Another very important factor is that our country is the home of industries that are receptive to technologies that can be developed by way of specialization—fundamentally, in the areas of the pharmaceuticals industry, the diagnostics industry, the veterinary industry, and above all in the agroindustries. By this," he explained, "we mean that we possess the two vital elements for a technological development effort: the scientific capability and the industrial capacity. The work being done in Argentina is being done also with the absolute conviction that biotechnology, engendering within itself alone an industrial revolution which in a way modifies the rules of play of relations between capital and science, will provide us an opportunity to create a relationship based on adulthood and maturity."

Training of Professionals

The representative of the Paul Hnos. Institute, Mr Jose Lopez, explained that his organization "developed the first oily adjuvant vaccine against hoof-and-mouth disease, which enhances immunity and permits a lengthening of the periods between applications to 6 months instead of 4. The institute produces 200,000 liters of prime-quality virus for the vaccine, and work is proceeding actively on installation of the first pilot plant that will utilize recombinant bacteria. In short, the institute will be going into biotechnology, with the ability to train

technicians and professionals for this new technology and to make it possible for Argentina to supply our real requirements in adequate time."

Dynamism of Private Sector

Dr Aldo Ferrer handled the closing of the meeting, pointing out that "In the experience of Banco Provincia and with seminars of this type that we have organized, the fruits emerge gradually with time, by way of contact between persons, between firms, between scientists, and as part of this process bear witness to the opening of channels of communication among the various players in the technological interchange. This is another step forward in connection with the international relationship of biotechnological development in Argentina, of its firms, with the United States."

In conclusion, he noted that "In this Forum, mention has been made of the potential for stimulating contacts between Argentina's firms and scientists and those of the United States, and I believe that we government, provincial, and banking officials, both of Argentina and the United States, can do something in this respect. In the final analysis, however," he said, "it will depend on the dynamism of the private sector, on its search for new opportunities, on its contracts and knowledge, on the interchange of information, as to whether these opportunities will indeed be realized."

09399/06662

Summary of Argentine Forum on Biotechnology

36990008a Buenos Aires ARGENTINA TECHNOLOGICA in Spanish Aug 87 pp 56-57

[Article by Jose Hector Fernandez Conti: "First Anniversary of the Argentine Forum on Biotechnology - Argentine Enterprise, Modern Economics and Biotechnology"; first paragraph is ARGENTINA TECHNOLOGICA introduction]

[Text] The Argentine Forum on Biotechnology held a seminar in which producers, businessmen, scientists, and government officials expressed their views on the commercial, productive, and technical future of biotechnology in their respective sectors of activity. The meeting was attended by Dr Manuel Sadosky, secretary for science and technology, who expressed his views as to the future this field holds for the country. The seminar took place in the Banco de la Provincia de Buenos Aires' Dr Arturo Jauretche Historical Museum and Archive. Coverage and media presentation of this event were headed by Jose Hector Fernandez Conti.

"Etymologically, biotechnology means technology of life. Another generally accepted definition," said lawyer Marcelo Arguelles, president of BioSidus and founding member of the Forum, "states that biotechnology is the use of live organisms, systems or biological processed to produce goods and services. This definition encompasses within its scope various aspects of biotechnology, but in my view the principal one is that of biotechnology as the product of industry, whose origin is rooted in science, but whose realization takes place in industry.

"This technology represents a new industrial revolution that is not based on iron, steel, and cement, but rather on microbes, bacteria, and years. Minuscule factories that, controlled by scientists, generate products, fundamentally in the fields of farming and livestock, personal health, and medical diagnostics, food production, mining, energy, and environmental protection. It is a tool that contributes to growth, evolution, and progress toward greater efficiency."

In the view of Dr Jorge Yanovsky, president of Polychaco and also an initial promoter of the Forum, "Biotechnological activity in our country must be centered on its potential for imparting a qualitative forward thrust to our means of production. In terms not of productive know-what but of productive know-how. We must address," he said, "not what we produce, since this is clear from Argentine history, but how we produce it. And delving into a biological understanding of the mechanisms that control the very nature of farming and animal husbandry, for example, will enable us to facilitate the participation of all our people more democratically in the generation of new biological goods. Because," he added, "all the potentials exist for transforming those productive activities in the farming and livestock field into mind-intensive activities."

"To the extent that we devote our resources to the production of fruits of the earth that we can enrich, by adding value through the proper management of production such as will yield products of excellent, we will be generating vast numbers of job sources at qualitatively much higher technological and social levels. This is the challenge of our times.

Opportunities and Biotechnology

Referring to the theme "Farming and Biotechnology," lawyer Roberto Levis of the Sociedad Rural Argentina [Argentina Rural Company] affirmed that the scarcity of food is the area in which "biotechnological research should make a decisive contribution that will enable elimination of the world's hunger problem."

"Presently," he said, "we are on the verge of a new green revolution, with predictions bordering on the fantastic and a potential for results that defy our imagination, despite the ongoing advances being made in recent times.... It is highly probable that before the start of the next century we will be in a position to create new varieties of agricultural species, resistant to cold and to numerous diseases, comprising veritable armored plants able to double the yields per hectare attained to date."

The present status of biotechnology in the farming and livestock entrepreneurial sector was addressed by Mr Jose Lopez, general manager of Paul Hnos, who discussed the agreement signed with the Israeli Research Institute toward the end of last year, under the terms of which tests are already under way in our country on a new product in the specialized field of foot-and-mouth disease prevention. The joint project with the Israeli Institute, which covers all of Latin America and the Caribbean, "includes the installation of the first pilot fermentation plant. Technicians and scientists are being trained for this project, in a daily working methodology that is expected to yield slow but steady advances.

"The Argentine Institute's effort will involve the construction of a purification plant, which is one of the most relevant considerations in the management of the biotechnology involved and of its products," Lopez concluded.

Economic Growth and Investment

In the opinion of engineer Vittorio Orsi, president of SADE S.A., "Genetic know-how, biochemistry, and cellular physiology combine to form a general framework of bases and theoretical steppingstones for the interpretation and utilization of the great natural laboratory in the service of the community. Biotechnology," he said, "with its potential for cellular fusion, for mass production of biomolecules, and for regulation of natural processes, presents itself as an activity whose aim is to increase productive capacity and improve the quality of products, with new and unimagined potentials.

"The key to a growth strategy," he said "is to realize appropriate alliances, so that the executive arm moves in step with universalized ideas and practices, rejecting marginal values and pursuing a policy of excellence of human resources, with emphasis on knowledge and on humanistic principles." He advocated associations of the joint-venture type with the best available partners from the standpoint of compatibility with our culture in every line of action chosen, while maintaining technological and geographical diversification for an advantageous spread of the risk.

Next, Dr Aldo Ferrer, who presently heads the Argentine Forum on Biotechnology, stated that the country has a significant shortage of risk capital. "Both in Europe and Japan as well as in the United States, there are institutions that specialize in this realm. These institutions," he said, "generate financing for firms that operate on the basis of new technologies and that by definition run high risks. The entities that finance undertakings operate on the basis that those that succeed are profitable enough to offset the losses incurred by those whose results are not satisfactory.

"Although there is still much to be done in this respect in Argentina, significant results have been achieved through the Banco de la Provincia de Buenos Aires' Prof Jorge Sabato Development and Technology Management department; and jointly with the Banco Nacional de Desarollo [National Development Bank], 50 innovative projects have been financed, representing a sum of over 200 million australes, and undertaken by firms in various sectors, such as those devoted to development in the nuclear, data processing, biotechnology, and metalworking fields among others.

"In any case," he pointed out, "experience shows that the number of applicants for such financing was less than expected, indicating that private investment has still not attained adequate momentum in Argentina.... New business will make its advent," Dr Ferrer continued, "by way of initiatives taken by the Argentine private sector, with government backing, in search of new associations with Brazilian firms, Japanese firms, and European firms; and here the potential for accords of vast importance for many sectors definitely exist, on the basis of the joint-venture system of agreements. We are sure to find that the technological contribution from abroad will not be forthcoming by way of investments of hundreds of millions of dollars; they will come in the form of thousands of smaller, dynamic, high-technology projects, configured according to the international system, but certainly rooted in our domestic system, because, without growth of our domestic market and without the know-how that is indispensable to the supplying of our own market, it will be very difficult to really penetrate the international system."

Funding for Biotechnology

"Is it feasible from an economic standpoint to allocate funding to biotechnology, with both our businessmen and the government knowing that the returns on this funding will be forthcoming in the medium term? Is it advantageous to do so?" These were the questions with which lawyer Beatriz Nofal, undersecretary for industrial development, initiated her participation.

Indicating that she indeed considered it advantageous, she added: "It must not turn into a massive strategy. As a country, we must select a few projects. Just a few projects that respond to the country's needs, that have a world sales potential, but that fundamentally respond to the needs of the country. It's advantageous to do so," she added, "because we can capitalize 10 years of research, to which 4 or 5 more years will undoubtedly have to be added; but it would be the first time in the history of Argentina's industrial and technological growth that, as a country, as businessmen, as a government and as scientists, we would be making an attempt to enter an industry before the product has entered a stage of maturity. This means that we could make an effort that would lead to an important role for us in industry at the world level. Not a leadership role, of course, nor anything close to that, but definitely a player's role."

She stressed that "We're not merely concerned with an industry, but rather with an interdisciplinary group of technologies that can be applied to many industries. After 10 years of research, biotechnology has today two or three products on the market, and others that are due to appear within the next 5 years. Hence, the importance of making the effort now."

09399/06662

DEFENSE INDUSTRIES

Brazil to Sell Sonda IV to Others as Tactical Rocket

Tactical Missile to be Ready within 5 Years

36990042 Rio de Janeiro O GLOBO in Portuguese 3 Jan 88 p 7

[Text]

Theoretically, and based upon the computer simulations, everything is working well. Designed to be launched from a platform mounted on feet on the body of a truck, the first Brazilian tactical missiles are able to carry multiple charges of up to 300 kg of explosives and strike targets located 1,000 km away.

In practice, some technological barriers will have to be negotiated, and financial resources will have to be secured to support development costs; but, a small group of engineers at Orbit Aerospace Systems—a company whose capital is divided between Embraer and Engesa—is accelerating its research so that the missiles will be operational within 5 years.

This development represents the militarization of products that the Aerospace Technical Center (CTA), as a sub-entity of the Aeronautics Ministry, developed for scientific purposes. At the heart of the Orbit project is the Sonda IV rocket, able to launch charges weighing 500 kg to targets 700 km distant, or charges weighing 300 kg to a target 1,000 km away.

"Our initial plan is to produce Sonda IV for scientific applications to serve a marginally interesting market, but, as in any arms industry, we are also interested in possible military applications, which constitute a market valued at $500 million a year," explained Orbit's Director of Operations, Sergio Coelho do Prado.

The company's president, Vito de Grassi, confirmed that goal, and added that the idea is to sell missiles with conventional payloads, or empty ones designed so that the client can place nuclear warheads aboard them.

Avibras Aerospace—the main Brazilian exporter of arms—has similar projects under way. Director Pedro Angelo Vial said, meanwhile, that the ground-to-ground missile project is being developed slowly because its support resources are unpredictable.

"When it is ready, in 3 or 4 years, the new product will be sold only with installed conventional charges, although they will be of various combinations and purposes. Nuclear arms play no part in Brazilian policy, much less in Avibras', for either the short or long term," he guaranteed.

There are two parallel projects. Avibras' is more sophisticated: a single-stage rocket 12 meters long, developed during the past 3 years as part of the SS family—the munition that is supplied as part of the Astros II artillery saturation system. Orbit's project is designed around a two-stage rocket weighing 7 tons that has already been launched three times by CTA in qualification tests.

There is much talk, meanwhile, that a vehicle like Sonda IV—in contrast with the Avibras SS-300, which is designed for the military—will itself be militarized. The practical tests with Sonda IV demonstrated that it has an average dispersion of 80 km. This means that, as things are, if it were used for military purposes, it could fall 80 km from its target.

Meanwhile, the first step necessary to set the Orbit project on the right path has already been taken. The inertial platform commanded by onboard computers, developed at CTA, will allow for a 90 per cent reduction in the Sonda's dispersion. The next rocket developed by CTA— the Satellite Launch Vehicle (VLS)—designed to launch Brazilian satellites by the beginning of the next decade, will have a dispersion that is much lower.

Avibras' Solid Inertial System—a kind of automatic pilot that guides the missile to its target—is ready. And, as in private industry, Avibras has its own means for acquiring more sophisticated components, such as gyroscopes, in the international market. For 3 years, CTA was faced with the American embargo on supplying components needed for its Sonda IV inertial platform, but during that period it found other suppliers. If necessary, the Aeronautics Ministry will seek out guidance and altitude control technology for its rockets from China or the Soviet Union.

VLS to Supply Military Version

36990042 Rio de Janeiro O GLOBO in Portuguese 3 Jan 88 p 7

[Text] The best launch vehicle for the military version of the Sonda IV is the VLS, a giant at 19 meters in height, four stages, and weighing 50 tons. Its development is being made possible only after 20 years of research and experiments conducted today by a group of 300 technicians and scientists at the Space Activities Institute (IAE), part of CTA. Its director, Brigadier Lauro Eduardo de Souza Pinto, guarantees that there is no other program capable of militarizing rockets such as the Sonda IV. But the concept is an old idea of Brigadier-Major Hugo de Oliveira Piva, ex-Director of Research and Development at Orbit.

To produce a missile with the dimensions of the VLS, however, is a more complicated matter. It has four stages with 40 tons of solid fuel, and its firing, using only the 4 first stage rockets, generates a thrust of 100 tons and a pressure that reaches 60 atmospheres within each thruster, and temperatures of 3000 degrees C. The extension of the VLS concept involves the development of fixed launch platforms that will allow it to be fired over a distance of 3,000 km carrying a ton of explosives.

The decision to do so will have to come through political channels, since a missile with a range of 1,000 km could reach any part of South America.

In any case, the VLS is a vehicle with a reasonable market in the civilian sector, and could sell in the international market for about CZ$ 10 million, while the missiles with a 300 km range could sell at a price between $2-5 million. The VLS was designed to place in orbit satellites of up to 150 kg at an altitude of 700 km. In 1990, it will be launched at Alcantara (MA), carrying a meteorological satellite.

It will be a critical test for the VLS. The program is behind schedule, and the VLS will not be tested beforehand. The scientists agree that it is a risky project, since there is always a chance that the satellite can be lost.

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Tactical Missile Development Reported

36990038a Rio de Janeiro O GLOBO in Portuguese 3 Jan 88 p 7

[By Eustaquio de Freitas]

[Text] Sao Jose dos Campos—In theory, during computer simulations, everything works well. The first Brazilian tactical missiles, launched from a platform on the back of a truck, are capable of carrying up to 300 kg of explosives a distance of 1,000 km.

In practice, some technological barriers must be overcome and funds must be obtained, but a small group of engineers at Orbita Aerospace Systems [Orbita Sistemas Aeroespaciais]—80 percent of this enterprise's shares are held by Embraer [Brazilian Aeronautics Company] and Engesa [Specialized Aerospace Engineers, Inc]—are stepping up their research so that the missile will be operational in 5 years.

This will mean the militarization of a device the Aerospace Technology Center (CTA), which is under the Aeronautics Ministry, developed for scientific research purposes. Orbita's project is based on the Sonda IV rocket, which can carry a 500 kg payload 700 km or a 300 kg payload 1,000 km.

Orbita operations director Sergio Coeli do Prado explained that "our initial project is to produce the Sonda IV rocket for scientific purposes in order to take advantage of an interesting nonmilitary market. But, as in any military related industry, we are also studying the rocket's military applications, which would involve a market of approximately $500 million per year.

Orbita Director Vito di Grassi confirmed this, adding the intention is to sell the missiles fitted with a conventional payload, or without a payload so the client can fit it with his own.

Avibras [Brazilian Aerospace Industry]—the main Brazilian weapons exporter—has projects of the same type. However, its director, Pedro Angelo Vial, asserted that the surface-to-surface tactical missile project is developing at a slow pace due to slow funding.

He asserted that "once it is ready, in about 3 or 4 years, the new product will only be sold with a sealed conventional payload, although it will serve several purposes. Nuclear weapons are not part of Brazil's policy, and less still that of Avibras in the medium or long term," said Vial.

In other words, there are two projects; the Avibras project is more modern. It involves a single-stage 12-meter rocket that was developed over a 3-year period on the basis of the SS—the ammunition [municao] used for the Astros II artillery saturation system [sistema de saturacao de tiros de artilharia]. Orbita's project is based on a two-stage rocket that weighs 7 tons and has already been launched by the CTA three times on a trial basis.

However, it will still require a long period of time before a rocket such as the Sonda IV—unlike the SS-300, produced by Avibras, which is designed for warfare—becomes militarized. During practical tests, the Sonda IV has shown an average dispersal of 80 km, which means that if it were used for military purposes it could drop 80 km from the target.

However, the first step in placing the Orbita project on the right path has already been taken. The computer-controlled inertial platform [plataforma inercial], which was developed by the CTA, will help reduce the Sonda IV's dispersion by more than 90 percent. The next item developed by the CTA—the satellite launching vehicle [veicula lancador de satelites]—which will be used to launch Brazilian satellites in the early 1990's will have a much smaller dispersion.

Avibras' joint inertial system [sistema inercial solidario]—a sort of automatic pilot that helps guide the missile to the target—is ready and, as a private industry, it has its own means to acquire more sophisticated components, such as gyroscopes, in the international market. The CTA was affected by the U.S. embargo on the supply of components for the inertial platform for 3 years, but it found other suppliers. Should it become necessary, the Aeronatics Ministry will seek the technology for altitude guidance and control of rockets in the PRC or Soviet Union.

The VLS, a gigantic 19-meter four-stage rocket that weighs 50 tons, is the best launching rocket for the military version of the Sonda IV. The development of the VLS is possible only after 20 years of research and testing by a team of 300 technicians and scientists of the Space Activities Institute (IAE), which is linked to the CTA. The IAE director, Brigadier Lauro Eduardo de Souza Pinto, asserts that they have no plans to militarize rockets like the Sonda IV, which he said is an old project of Major General Hugo de Oliveira Piva, former CTA director and current director of the Orbita Research and Development Department.

Producing a missile to fit the VLS, however, would be a more complicated project. The VLS has four stages and carries 40 tons of solid fuel. Launching the VLS, with only the four rockets in the first stage, generates 100 tons of thrust and 60 atmospheres of pressure inside each cylinder, which heats up to 3,000 degrees centigrade. Making the VLS feasible means developing fixed launching platforms that will make it possible to fire it a distance of 3,000 km with 1 ton of explosives.

This is necessarily a political decision. After all, a 1,000-km-range missile can reach any point in South America.

Nevertheless, the VLS is a vehicle with a reasonable market in the civilian sector and could be sold on the international market for approximately $10 million, while a missile with a range of 300-1,000 km would cost between $2 and $5 million. The VLS was designed to place 150-kg satellites in orbit at an altitude of 700 km. It will be launched from Alcantara (Maranhao State) in 1990 carrying a weather satellite.

This will be the VLS's trial by fire since the program is behind schedule and the vehicle will not be tested beforehand. The scientists admit that it is a risky project because there is always a chance of losing the satellite.

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Development of Air-to-Air Missile Reported

36990039a Sao Paulo O ESTADO DE SAO PAULO in Portuguese 7 Jan 88 p 2

[Text] Brasilia—Within 30 days the Aeronautics Ministry will sign a contract for the purchase of MOL-1 air-to-air missiles manufactured by the Sao Paulo enterprise Orbita. These missiles will equip the Mirage III and the F-5e fighter-bombers, in addition to the future AM-X. Embraer [Brazilian Aeronautics Company] will begin delivering the AM-X planes to the FAB [Brazilian Air Force] beginning this year. The purchase of Brazilian-made missiles is part of the nationalization and self-sufficiency program the Air Force has carried out over the past 10 years.

The Brazilian air-to-air missile is equipped with an infrared sensor to track an enemy plane's jet engine and destroy the plane by activating a computerized homing device. It is part of a family of missiles that began with the U.S. Sidewinder and was modernized by other countries of the world such as Great Britain, Italy, the Soviet Union, and the PRC.

The Brazilian missile was developed by the Aerospace Technology Center (CTA) in Sao Jose dos Campos (Sao Paulo) and later passed over to the D.F. Vasconcellos Company of Sao Paulo, which was charged with finishing the missile and manufacturing it commercially. This company, however, encountered serious economic problems, and the missile was again given to Orbita, a company created with capital from Angesa (manufacturer of heavy tanks such as the Cascavel and the Osorio) and Embraer (manufacturer of the Brasilia, Tucano, and AM-X planes), in addition to a small percentage of private capital.

According to unofficial reports from the Aeronautics Ministry, the initial contract is for $40 million. The first lot of missiles will be used to equip the F-5e fleet, comprised of 26 aircraft; the Mirage III fleet, comprised of 15 warplanes; and 79 AM-X's. The initial purchase of these missiles will possibly number 250 to 300 units.

The Brazilian policy of never restricting the sale of a product to the internal market will also allow its marketing in the international arena. Only the Soviet Union, the PRC, the United States, and the EEC countries have sold this type of missile so far. The missiles have been used to equip warplanes, helicopters, and antiaircraft batteries.

/12913

METALLURGICAL INDUSTRIES

Brazilian Centers of Excellence in Powder Metallurgy

36990037 Sao Paulo METALURGIA-ABM in Portuguese Dec 87 pp 917-920

[Unsigned Article: "Academic Research in Powder Metallurgy"]

[Text] At this time, various engineering schools and institutes in Brazil are involved in research dealing with powder metallurgy. Professors Cassio R.S. Lira and Lucio Salgado, respectively, chief and assistant at the Powder Metallurgy Laboratory, IPT (Institute of Technological Research) of the State of Sao Paulo, announced that this Institute has greatly improved its studies and research since it was first established in the 1940's.

In the 1970's, the IPT Powder Metallurgy Laboratory underwent a reorganization geared toward the development of technology designed to secure metallic powders in an effort to solve the raw material problem. New equipment was procured and it now constitutes the Laboratory's current structure:

—induction furnace for fusion with a capacity of 50 kg (in terms of iron alloys);

—oil fusion furnace with a capacity of 200 kg (in terms of copper alloys);

—sintering furnaces with controlled atmosphere;

—muffle-type furnace;vacuum-sintering furnace;

—200-t hydraulic press for tests;

—20,000-N/cm^2 hydrostatic press;

—ball and hammer mill;

—classifying and homogenizing screens;

—equipment for the characterization of metallic powders;

—system for obtaining metallic powders for electroplating;

—pilot plant for production of iron powder with an installed capacity of 40 t/month;

—air and gas atomization unit.

With the help of this facility it was possible to develop various techniques for the procurement of metallic powders, such as gaseous reduction, electroplating, chemical processing, carbon-thermal reduction and, primarily, atomization of liquid metals. Various types of metallic powders were obtained, with the following being outstanding: copper and its alloys, aluminum and its alloys, iron, nickel, powders for metal coating, tungsten, molybdenum, and cobalt, among others. Some of these materials were produced in a pioneering fashion in Brazil, such as electrolytic iron powder, air-atomized iron powder, obtained in a pilot plant with a nominal capacity of 40 t/month, and nickel powder. More recently, a technology was developed for the procurement of 316 L inoxidable steel powder which was employed successfully in making filters and structural parts. The Powder Metallurgy Laboratory is now able to provide services through the characterization of metallic and sintered powders. Here we must single out an important study done together with the chief enterprises in the sintered materials sector, entitled "Procedures Recommended for the Control of the Reception of Iron Powders." This work contains a compilation of the main standards in powder metallurgy, along with a description of 16 types of domestic and imported iron powders; this supplies identical language that can be used between the producers of iron powder and its users. With a view to solving these problems once and for all, a powder metallurgy condition was established in the ABNT [Brazilian Technological Standardization Association], where the IPT participates in the development of a Brazilian standard (see note on this subject). We must further underscore the effort made by the IPT, with the support of the ABM, in connection with the establishment of a Powder Metallurgy Commission whose objective it is to improve relations between enterprises, research institutes, and universities. The first step in this direction was taken in the form of the 1st Powder Seminar, in the ABM, which was held in August of this year and which was coordinated by EPUSP Professor Clovis Bradaschia and by IPT engineer Lucio Salgado.

Future Prospects

As for the procurement of metallic powders, prospects point to the development of a national technology for the production of powders of special steels, such as inoxidable steels, tool steels, and fast steels, which are being used increasingly in industry. Another major development has to do with the procurement of magnetic materials where the IPT studied the Fe-Nd-B alloy together with the Physics Institute of USP [University of Sao Paulo, plus other important alloys, such as Fe-Ni, Fe-Si, and Fe-P. The feasibility of using plasma in powder metallurgy was also studied with a view to producing extra fine metallic powders.In the area of consolidation, studies presently relate to the development of a technology for the procurement of extruded products on a base of metallic powders. To begin with, techniques are being developed for the extrusion of high strength aluminum alloy powders to be used in the aviation industry. Improvements in relations between enterprises, research institutes, and universities, through a more efficient disclosure of knowledge, should facilitate the identification of priorities for research, thus permitting more accentuated technological development in powder metallurgy at a national level.

EPUSP

The Metallurgy Engineering Department of EPUSP has extensive experience and skills supplied by instructors in powder metallurgy; there are four professors in this area. The skills extend from the area of processes involved in the procurement of metallic powders through reduction, electrolysis, atomization, and even sintering. It has personnel trained at Drexel University, PA, who have attended international powder metallurgy congresses. One of these lecturers was responsible for the current establishment of the Powder Metallurgy Laboratory, Metallurgy Division, IPT, starting in 1974; in this capacity, he developed processes for air, gas, and water atomization designed to obtain metallic powders and metal alloys (aluminum, copper, bronze, and iron) as well as a process for the production of iron powder through decarbidization in a box of iron powder atomized from above. A pilot unit was installed and this process was adopted in the end. Brazil helped pioneer in the development of electrolytic iron powder procurement.

The area of iron powder procurement through reduction was also exhaustively developed by another lecturer on a semi-industrial scale with the support of FINEP [Funding Authority for Studies and Projects].

In the experimental part, the Department maintains close cooperation with the Powder Metallurgy Laboratory, Metallurgy Division, IPT, which is extremely well equipped, as described earlier.

Work done or in progress as part of this cooperative effort includes the following:

—1. "Study of Iron Powder Carbide Removal" (post-graduate).

This work consisted of studying the parameters for prior oxidation of iron powders with a high carbon content. After treatment in a box, powder was obtained with high compressibility and low loss to hydrogen.

—2. "Procurement of Copper Powder through Gaseous Atomization."

This work was aimed at establishing the conditions for the atomization nozzles, the gas flow rate, and the metal flow rate for the procurement of copper powder with specified morphological grain size distributions.

—3. "Procurement of Niobium Carbide through Carbon-Thermal Reduction" (post-graduate).

This study pertained to the influence of the time, temperature, and treatment pressure for the carbon-thermal reduction of niobium oxide through carbon (in the form of lampblack).

—4. "Sintering of Inox 316 Steel with Addition of Powder of Fe-Nb" (scientific initiative).

This study was aimed at assessing the diffusion of niobium and possible precipitation of Fe_2Nb during cooling.

—5. "Procurement of Carbides through Carbidization of Iron Alloys" (post)graduate).

This is a line of research in which one of the lecturers is a co-inventor on an international patent application and an M.A. dissertation is in the final editing phase.

FEJ-UDESC

The Mechanical Engineering Department, Joinville School of Engineering, FEJ-UDESC, through the manufacturing processes and materials division, in recent years concentrated and developed various activities aimed at the exploration and better knowledge of powder metallurgy, both in Brazil and abroad.

The Department has a powder metallurgy laboratory which is now being set up; it also has two full-time professors working in this field. Here are its most important activities:

—Teaching the subjects of powder metallurgy and ceramic materials for some students in mechanical engineering (graduation), starting in 1987. FEJ-UDESC.

—Organizing a series of lectures on powder metallurgy in June (1st part) and October 1987 (2nd part), with the participation of the main enterprises in the sector, in Joinville, SC [Santa Catarina], in 1987.

—Technological Refresher Course in Engineering for Industrial Personnel dealing with sintered steels and hard metal, Joinville, SC, in 1987.

—Powder Metallurgy Laboratory establishment phase, for studies and research in the area.

Publications

1. "Steels Sintered with Nickel and Copper," doctoral thesis, E.T.S. Mining Engineers, Madrid Polytechnical University, Spain, 1986 (Dr)Engr Walter Contreras Zapata).

2. "Collection of Studies on Powder Metallurgy," 20 Years of Powder Metallurgy in Brazil (1966)1986), 30 papers, FEJ-UDESC/ETT, 1987 (Dr)Engr Walter Contreras Zapata).

3. "Production and Mechanical Properties of Sintered Carbides (Hard Metals WC-C)," M.A. dissertation, UFSC [Santa Catarina Federal University], 1987 (MS, engineering, Gilmar Ferreira Batalha).

4. "Cycle of Lectures on Powder Metallurgy." Yearbooks of Lectures Given 24-25 June 1987 (1st part) and 28-29 October 1987 (2nd part). FEJ-UDESC, Joinville, SC, 1987.

In addition to these, various studies were submitted to domestic and international congresses.

Research

During the initial phase, research is being done both to assess the possible reuse of cast iron chips (1st stage) and bronze chips (brass) (2nd stage), as low-cost raw material via powder metallurgy.

Future Prospects

It is now necessary to train and hire personnel highly skilled in the area, and to get government support for the re-equipment of the laboratories with a view to pursuing ongoing research and other new undertakings planned for 1988. The inclusion of the post-graduate course, at the specialization level, in materials engineering (1988)

and the approval of some pending projects in government agencies will decisively contribute to accomplishing research and development on new lines and/or processes via powder metallurgy, thus strengthening and expanding the research group in this area, in Joinville, Santa Catarina.

UFRGS Laboratory

Professors Lirio Schaeffer, Sandra Mara O. Einloft, and Arao de Matos Dias, of the Mechanical Shaping Laboratory, UFRGS (Federal University of Rio Grande do Sul), are involved in powder metallurgy activities and have already achieved important results.

The post-graduate studies program in metallurgy, through the Laboratory, LACON, has made a major effort to develop powder metallurgy techniques with the main objective of obtaining new materials and competitive processes.

One of the Laboratory's concern has been to disseminate this technique to the various sectors, both in industry and at the universities, throughflectures, seminars, and publications, as well as by means of direct contacts with industry.

The Laboratory has four researchers in this area and some trainees who are doing research geared toward the community's most pressing needs.

Research is now being done on steels alloyed with chrome, manganese, molybdenum, nickel, and tungsten; cemented and tempered iron parts, with high abrasion resistance (MHV 100 = 950), low density (6.0 g/cm^3), and very tight dimensional tolerances, for use in electrical devices. Sintered forged [wrought iron] parts have also been the target of research with a view to their broad utilization in the auto industry, especially in the light of the great advantages offered both in terms of resistance and ease of manufacture.

The importance of this research effort springs from the good conditions prevailing in the production of precision parts, without any need for any subsequent machining. Alloys of aluminum, in addition to steel alloys, are being sintered for subsequent forging.

Sintering of aluminum alloys, with additions of Al_2O_3 to improve the material's resistance, is another effort which has been under way for some time now, with some positive results.

Sintering of bronze, for self-lubricating bushings, and those made of copper for electrodes, were developed in order to replace the conventional machining process.

Many other efforts are directed at increasing the activities of the Laboratory in the field of powder metallurgy, always with the main intention of meeting the most urgent needs of technology, the researchers concluded.

FEI

The FEI (Industrial Engineering Schools), of the Applied Sciences Foundation, in Sao Bernardo do Campo, S. Paulo, are continuing their regular courses in metallurgical engineering and regular mechanical engineering, in other words, fields relating to powder metallurgy, given by professors Domingos Theodoro Figueira Filho, Luiz Carlos Martinez (team leader), and Henrique P. Rizzo.

In the metallurgy area, this field is a part of the program for the 9th period (5th year), with the following emphasis on basic theory (2 hours per week) plus laboratory work (1 hour per week):

1—Introduction, concepts, and typical applications of powder metallurgy technology.

2—Characterization and procurement of metallic powders.

3—Compacting and sintering.

4—Subsequent finishing operations.

5—Heat and surface treatment.

6—Mechanical properties and selection factors.

7—Equipment and processes.

In the regular mechanics area, powder metallurgy technology consists of the MC-195 metallurgical technology field program, during the 7th period (3rd year), with basic emphasis on theory (2 hours per week), broken down as follows:

1—Introduction, concepts, and typical applications of technique.

2—Description of techniques for obtaining metallic powders.

3—Characterization of metallic powders.

4—Compacting, sintering, and subsequent processes.

5—Mechanical properties and selection factors.

6—Project parameters.

The Powder Metallurgy Laboratory of the FEI has been operating for a year now.

05058

NUCLEAR DEVELOPMENTS

Brazil's Major Investment in Nuclear Power Plant Simulator

36990045a Sao Paulo ENERGIA in Portuguese
Sep 87 pp 9-12

[Article: "NUCLEBRAS: Services to the World"]

[Excerpts] Even with the temporary stoppage in construction of the Angra 2 Nuclear Power Plant and the recent technical problem discovered at Angra 1, prompting serious debates on the issue of the Brazilian nuclear program, NUCLEBRAS [Brazilian Nuclear Corporations, Inc] currently has the most modern simulator in the world to operate a nuclear power plant, of the KWU/Angra 2 type. Besides constituting a major source of foreign exchange for the country, the simulator is known throughout the world, not only for the high technological standard of the equipment, but also for the high technical quality of the Brazilian operators, who have rendered excellent service to foreign technicians.

The Angra 2 Nuclear Power Plant simulator was installed in the NUCLEBRAS Training Center, at Mambucaba, in the municipality of Paraty, near the site on which that power plant is being built. The initial purpose of the project to install a simulator, in Brazil, at the Angra 2 Nuclear Power Plant was solely that of providing training to operators for the nuclear power plants manufactured by KWU (Kraftwerk Union) to be installed in the country.

According to Eng Sergio G. Mathias, superintendent of the Advanced Simulator Training Center (CTAS), "Despite the initial interference with this objective, owing to delays occurring in the Brazilian Nuclear Program, particularly in the construction of Angra 2, this project, completed with the installation of the simulator at the NUCLEBRAS Training Cneter, resulted in an organization that has been achieving international prestige, through the execution of an extensive program to train operators for foreign nuclear power plants."

In engineer Mathias' opinion, the fundamental factor for the success of that program was the formation of a team of technicians to participate actively in the work during the entire period of the design, construction, and testing of the simulator in Germany and France, and, subsequently, during its temporary use in Germany.

That team is the one currently responsible for the operation and maintenance of the simulator, and for providing the foreign operators with training. Concurrently, it has contributed to the training of new technicians who will soon be assuming responsibility for the center's operation.

The simulator is the heart of CTAS. Its control room is a functional replica of the control room at the Angra 2 power plant, containing virtually all the instrumentation; which makes it possible to reproduce the same visual and acoustical (alarm) effects that would occur at the power plant, if subjected to the same operating conditions.

Early Training

As a result of the high security and availability standards of a nuclearpower plant, the training of the operating team usually begins nearly 4 years before the first load of fuel is installed in the plant; and, in terms of time and cost, this is one of the greatest efforts for human resources undertaken by the power plant utility.

Training with a simulator has been established as the most effective and economical method for initial training and for maintaining the plantoperating team's competence. Economic reasons would preclude frequent maneuvers at a nuclear power plant, such as: starting, stopping, and load variations. And security reasons would also preclude the training of operators under abnormal conditions, particularly those involving accidents.

The installation of the Advanced Simulator Training Center is intended "to meet the demand for the training of operating teams for Brazilian nuclear power plants of the PWR-KWU type, and will result in relative independence from having that service rendered by foreign companies, with the consequent savings of foreign exchange, in addition to giving the operators training in the Portuguese language, geared to the country's conditions," as Sergio Mathias remarked.

Categories

According to Eng Sergio Mathias, "CTAS is prepared to provide training for personnel qualified for licenses (operators of PWR [pressurized water reactor] type nuclear power plants of KWU make), and those not qualified for licenses (plant management, loading office, personnel responsible for the licensing of operators and/or for the commissioning of power plants, etc.)."

The engineer also declared: "The training of personnel on the plant management level offers a general view, that is more or less intensive, depending on the service requirements, and the plant's performance, including its availability and limitations."

Mathias observed: "The courses for loading office operators are aimed at offering an overall view of the power plant's operation, focusing mainly on availability for generation and speed in load variation. The training for personnel responsible for licensing and/or commissioning includes the operation of the power plant systems and the operator's performance under various operating conditions."

Investments

Inasmuch as the training phase for Angra 2 operators with a simulator has not yet started, CTAS has, since the beginning of its operation in Brazil, been carrying out an extensive training program for foreign nuclear power plant operators.

During the period from September 1985 until April 1987, a total of five German nuclear power plants, namely, Grohnde, Philippsburg, Isar, Neckarwestheim, and Emsland, had their operating personnel trained at CTAS; and a sixth one, Brokdorf, has training contracted for this year. In addition, CTAS sponsored courses for KWU personnel responsible for the commissioning of power plants, for operators of Spain's Trillonuclear power plant, and for technicians from the National Security Council of Spain.

Last August, CTAS concluded a contract with Argentina's Atucha 1 Nuclear Power Plant, which will send operators for training in Brazil until the end of this year.

The vast majority of the Germans trained at CTAS consists of licensed operators who are engaged in retraining, for the prime purpose of practicing the procedures in situations marked by malfunction and accident, in courses lasting 2 weeks.

Among the Spaniards, the vast majority is comprised of technicians who are receiving initial training to be qualified as operators at the Trillo power plant, which is due to go into commercial operation at the beginning of next year, in courses lasting from 3 to 6 weeks. Furnas and NUCLEN [NUCLEBRAS Engineering, Inc] are among the national entitiesthat have already used the CTAS services.

The cost of this service is collected through a unit that CTAS has set based on courses per week. The minimum period is 5 days of training, with 4 hours per day spent on instruction with the simulator, and 4 hours per day spent in the classroom. The contracts for providing service stipulate that the charge for courses per week is made based on groups, which must not exceed six operators. Thus, for every group assigned to a 5-day course, the contracting firm pays CTAS/NUCLEBRAS 790,000 cruzados. However, this amount is not the same one charged in 1986, that is, 890,000 cruzados. The reason for this reduction is due mainly to the sizable increase in demand.

By last July, 123 courses per week were held, and 292 operators were trained. The CTAS timetable calls for an additional 58 courses this year, which will involve nearly 120 operators from nuclear power plants in Germany, Spain, and Argentina.

From the beginning of the simulator's manufacture (1978) until its final installation in CTAS (1985), NUCLEBRAS invested $13,156,000 in its establishment ($8,414,000 in the simulator, $1,270,000 in the premises and furnishings, and $3,472,000 in other expenses). These amounts pertain to the month of July of this year.

It is important to stress that the income generated by the training of personnel from German and Spanish entities from September 1985 to April 1987 was $1,612,000; while the sum for the courses already contracted for by the same users from May to December of this year is equivalent to $1,853,000.

Therefore, during the first 2 years of operation, CTAS will have generated income amounting to nearly $3 million from the training of foreign technicians.

Uncertain Future

Nevertheless, although the income accrued to date has been considerable, the prospects for training personnel from the German power plants for 1988 are not so promising, in principle, owing to the likely entry into operation, at the end of this year, in Germany, of a simulator purchased by Kraftwerksschule E.V. (an association of European utilities engaged in training personnel for thermal power plants in general), which has asa reference the Grafenrheinfeld Power Plant, technologically more advanced than the simulator installed in CTAS.

Sergio Mathias emphasized: "Consequently, NUCLEBRAS has been expending efforts to introduce into the simulator all the technological advances that are being incorporated into the designs of the most recent German power plants (Isar, Emsland, and Neckarwestheim), in order to maintain the high level of technical training of the CTAS personnel, aimed at preserving the demand for the training services among at least part of the present German users."

New Fields

According to the president of NUCLEBRAS, Licinio Seabra, "The fact that this simulator exists in Brazil, already in operation, makes it possible, through analyses and comparisons, to progress with a national capacity for the design and construction of simulators."

He claims that the technology acquired with the simulator will be possible to utilize in other sectors, such as aeronautics and industry. "The development already achieved in our computer science infrastructure and in the industry itself affords interesting prospects in terms of a certain national capacity in this field."

The president also gave a reminder that, "The simulator is, in addition, an important tool toward the goal, although it is a long-term one, of participating in the international market, exporting nuclear technology, and selling equipment."

With regard to the future, the NUCLEBRAS president pointed out: "For the simulator to really be used to the fullest and render its services, it must be accompanied by continuity in the development of the nuclear program for plant construction, at a pace compatible with our national potential, but so as not to create a discontinuity in the process. Otherwise, it could cause the loss of assets that have been acquired, basically, the personal assets."

Licinio Seabra concluded by saying: "If, due to circumstances, we should delay further still the Angra 2 and 3 power plants, the simulator has an external area for operating, but that is not its main purpose, which is for internal use."

2909

SCIENCE & TECHNOLOGY POLICY

Brazilian Scientists Flee Government for Private Sector

36990034 Rio de Janeiro O GLOBO in Portuguese 22 Dec 87 p 7

[Text] Brasilia - Brazilian scientists are trading their lab jackets and government laboratories for sober business suits, James Bond attache cases, and airconditioned, carpeted offices. Transforming themselves into executives of big private companies, they are earning salaries that are never less than triple what they were earning as researchers on the public payroll.

Given the unlikelihood of salary increases sufficient to encourage the scientists to resume their research, Brazilian university officials are already predicting that the situation may be untenable in the long run.

"We need to train new researchers for the next 10 or 20 years," says Prof Isaac Reitman, dean of the Department of Research and Extension of the University of Brasilia, (UnB). In his opinion, this is becoming "more and more difficult, because the good scientists want to be financially compensated for their talent and this is virtually impossible in government agency work."

Prof Reitman said that scientists who leave research have also opted to enter the liberal professions or to go into business. "Our salaries lose value from one day to the next. Last April, a UnB professor was being paid the equivalent of $2,000 (about 130,000 cruzados). Today, his salary is worth half that. "Any private company would hire one of our scientists at a salary equivalent to at least $3,000 (about 220,000 cruzados) a month," says Reitman.

The flight of scientists into private enterprise is a problem at all government agencies that are engaged in research. The Brazilian Forestry Development Institute, (IBDF), for example, lost 500 of its 3,700 employees to the private sector last year. Of the 8,000 employees which the institute hired when it was created 20 years ago, fewer than 3,000 remain. Antonio Jose Guimaraes, president of the IBDF, acknowledges the frequent loss of employees to private enterprise, especially because of the salaries: 2 months ago, the entry-level salary of a forestry engineer at IBDF was 11,000 cruzados per month, while private companies were hiring at 35,000 cruzados.

Last July, the Ministry of Science and Technology decided to double the salaries of scientists at the National Institute of Space Research, INPE. According to experts at the National Council for Scientific and Technological Development, (CNPq), that was the only way to avoid losing all the scientists to Sao Paulo companies.

The specialized technical assistant for the engineering department of the CNPq, Carlos Pitalunga, reports that certain sectors are more sensitive to the present crisis. In Sao Paulo, for example, universities can't interest recent civil engineering graduates in research. This is because engineering firms offer them salaries of 40,000 cruzados per month, while a grant for study toward a master's degree would not exceed 25,000 cruzados.

In an attempt to change this picture, the CNPq will be making "scientific startup grants." Under this program, a university professor selects his best third-year or higher-level students to receive 7,000 cruzados every month for a year in return for initiating some research project in their fields.

In Prof Reitman's opinion, the outlook can only be changed by a decision of the legislative and executive branches of government. "Brazil must have intellectual independence. The Brazilian Society for the Advancement of Science has already submitted documentation warning of the problem, but nothing has changed," lamented the professor.

12830

TECHNOLOGY TRANSFER

Technological Support for Space Program Sought From PRC, USSR

Specific Areas of Needed Technology Identified

Rio de Janeiro O GLOBO in Portuguese 29 Nov 87 p 18

[Text]Brasilia—Since April, when the seven most industrialized Western nations—the United States, Germany, France, England, Canada, Japan, and Italy—decided at a meeting in Washington to suspend the sale of satellite components, systems, and parts, and even technical assistance to developing countries, Brazil turned to China and the Soviet Union in search of technological support to develop its space program.

In the case of Brazil, the rationale used by the "Big Seven" for the boycott was the growing development of the parallel nuclear program and the risk that this program could be added to the space program being developed by the National Space Research Institute (INPE) and the Aerospace Technical Center (CTA), bearing in mind the manufacture of strategic missiles.

The military ministers have more than once stated that the Brazilian nuclear program is peaceful in character, but those guarantees were considered inadequate for the 7 Western nations. Result: with the lack of support for the Satellite Launching Vehicle (VLS), the Brazilian space program suffered a 1-year delay.

Among the difficulties presented is the lack of a reliable guidance system for the VLS. Brazil's production of inertial platform elements is in the experimental stage. It also needs liquid fuel technology. China has both. On the other hand, it needs a reliable technology for solid fuel—which is more appropriate for its ballistic missiles—which can be supplied by the CTA in San Jose dos Campos (Sao Paulo). Another advantage offered by Brazil to its new partners is the location of the Launching Base at Alcantara (Maranhao), which is near the equator, permitting use of the earth's rotation as a kind of slingshot to help accelerate rockets. With this assistance, bigger cargoes can be launched with less energy output by the launch vehicle.

Soviet cooperation is taking a different route: remote sensing. The Soyuz Karta, an enterprise responsible for marketing Soviet space technology, intends to sell Brazil the information garnered by the satellites in the Cosmos series. Brazil also is interested in this technology to launch its own remote sensing satellites in the 1990s.

The most concrete proposals for cooperation are being made by the Chinese, and there is a real possibility for development of a joint project. According to an employee of Itamaraty, the Brazilian government wants to give priority to agreements that will signify an effective exchange of technology, and not a mere exchange of products and services.

The agreements with China had already begun in 1982, when an accord for scientific and technological cooperation was signed. In 1985 and 1986, there were meetings of the Brazil-China Joint Commission, where the matter was also broached. The then Minister Science and Technology, Renato Archer, visited China, along with the Director General of INPE, Marco Antonio Raupp. Next week, China's Vice-Minister of Astronautics will come to Brasilia and will visit INPE and CTA in Sao Jose dos Campos. The signing of additional protocols is not foreseen, but the visit is intended more as a stage in the negotiations. Cooperation with China envisions the building of remote sensing satellites and the exchange of goods and services, in addition to launching satellites. The decisions may be made during President Jose Sarney's visit to Beijing next year.

More Frequent Contacts Made With China

Sao Jose dos Campos—Brazilian progress in several fields of scientific and technological knowledge and the country's great potential for utilization of resources and foreign technology constitute the chief inducements for a large number of foreign nations and research institutions to come to Brazil to present and discuss proposals for technical, scientific, and industrial cooperation. At present, the demand is greater on the part of the Asians, who are mainly interested in space technology. To get an idea, in the last 20 days representatives from at least 6 countries have arrived.

The most frequent contacts are made with China, which next week will send a delegation to the National Space Research Institute for another round of negotiations. The mission is led by the Vice-Minister for Astronautics, Bao Kenning, and includes technicians from the Ministry of Aeronautics, the Space Technology Academy, and the China Great Wall company, which is responsible for space negotiations for China abroad.

The proposal, which serves as a starting point for joint projects, is to build a satellite for remote sensing of natural resources to be launched in 1995. It would be a 1000-ton vehicle, placed in orbit at an altitude of 400 km, to be marketed by both countries. The main objective, however, is the creation of small joint programs for development of satellite systems, components, and parts.

These small programs, which are in the interest of both countries, will be the channel through which considerable trade in space subsystems will be established. If necessary, 3-way operations will be undertaken, in which one country will resell to another the equipment not obtained in normal, direct trade due to restrictions by the producing countries.

The thing that most interests the Chinese at this time is the purchase of medium- and large-capacity computers, compressors, refrigerators, refrigerated chambers, and electronic components that it is unable to buy in the West. Brazil would enter as a direct supplier in some cases— there are direct accords with the Imbraco company of Santa Catarina to buy compressors—or it would purchase abroad some models of computers to be resold to the Chinese. In return, they offer the technologies of rocket launching, thermal treatment, and systems for satellite altitude control and rocket and missile guidance, among other items.

The accords for that system of cooperation and China's commercial offer to launch the first Brazilian satellite in 1989—the development of the Brazilian Launch Vehicle is behind schedule and will not be completed in that year—are being discussed by an advance team from

China and it is expected that the final documents will be signed next week, right after the visit of President Jose Sarney to the National Space Research Institute.

Raupp Says Soviets Offer Little

Sao Jose dos Campos—The Director General of INPE, Marco Antonio Raupp is awaiting the visit of scientists from the Soviet Union in the next few weeks, but he is skeptical: "To date, the Russians have only made very limited scientific proposals to us, and what we need most at present are the technologies that we know they have mastered."

Raupp hopes that the Brazilian government will continue searching for new possibilities for exchange, in the same say as will be done with China. The developed or purchased parts receive a value that is added into the bilateral trade to result in a zero balance. This is what is now occurring with Hungary: INPE needs VAX computers that the Americans do not want to sell, but the Hungarians have perfect copies of the equipment and they have a trade deficit with VALE of Rio Doce.

With Canada, the accords provided for training and equipment, such as land-based stations for communications with aircraft and shipping accident alert satellites, and satellite mission control technologies. Another area of great cooperation is with France, which is now more restricted to commercial contracts for consulting and technical assistance. Exchange with Germany is carried out mainly in scientific research and propulsion. Technical advice and technologies for use of remote sensing satellites are also obtained jointly with the European Space Agency, and now can come from Japan as well, which is proposing a program that includes the participation of INPE in the development of scientific satellites and rockets—compensation for the purchases that INPE is making in the Japanese electronic components market.

Mission from China Comes to Discuss Space Accord

33420032a Rio de Janeiro O GLOBO in Portuguese 24 Nov 87 p 7

[Text]Brasilia—A delegation from the Technology Ministry of the People's Republic of China arrives in Brazil tomorrow at the invitation of the Minister of Science and Technology, Luiz Henrique Lima, to visit various research institutions linked to the Complete Special Mission of Brazil, which will launch a satellite in 1991.

At the National Special Research Institute (INPE) in Sao Jose dos Campos, the group will take part in discussions to define China's future cooperation with Brazil in the field of space. According to sources from the Ministry of Science and Technology and the Embassy of China in Brazil, the discussions will be limited to monitoring and power-supply systems for satellites and equipment for rocket tracking.

China, like Brazil, has shown itself to be quite interested in obtaining self-regenerating mini-reactors of the fast-breeder type, used in satellites. This system of power supply increases the useful life of satellites by 300 percent, compared to the system of obtaining energy by means of solar cells. A satellite powered by solar cells lasts, on average, 7 years. With a mini-reactor powered by plutonium, this same satellite would have a useful life of 20 years. This technology has been mastered only by the Soviet Union, which employs it in its Cosmos series. The studies in the Aerospace Technical Center on the manufacture of an experimental fast-breeder are in the advanced stage. On the other hand, the Chinese are more advanced in satellite-monitoring and rocket-tracking systems employing advanced techniques, such as the technique for utilization of special ships with large radar antennas.

13331

PRC Delegation Visits Brazil's Technical Centers

36990036b Rio de Janeiro INFO in Portuguese Dec 87 p 30

[Text] This was the third Chinese mission to visit the country in the past 2 months. During the 10 days that they spent here (from 3 to 13 November), the members of the group sent by the World Bank visited national computer and telecommunications firms, areas considered a priority for the new China's development. The final outcome did not prove positive for Brazil. The only objective result was the expression of the Chinese interest in intensifying the program to train human resources, started by the two countries in 1984, when both governments signed a cooperation program which dealt with the computer sector particularly.

During the last week in October, one of the groups visited the Sao Paulo State Data Processing Center (PRODESP), and the Clinic Hospital. And, during the first week of November, Chinese economists were at EMBRAER [Brazilian Aeronautics Company]. The president of Digiponto and former president of the Brazilian Association of Computer and Peripheral Industries (Abicomp), Antonio Mesquita, claims: "This is a sign that the selection of Brazil as one of the countries to be visited by the Chinese did not occur by chance; it is a result of past efforts." As early as 1984, the entity organized three trips to China, and scheduled the visit by Chinese technicians to several national industries. At the time, Abicomp had in mind the notion of encouraging technological cooperation.

The president of Microlab, Antonio Didier Vianna, gives a reminder: "We only failed to achieve a technological cooperation program through the fault of our directors."

A large portion of the Chinese visit was sponsored by Brazilian firms interested in intensifying the contacts with China. They include Elebra, ABC, Sharp, and Gradiente. In addition to visiting the headquartes of thse

companies, the Chinese went to the Ministry of Finance, where they were received by Minister Bresser Pereira himself; the Ministry of Communications, SERPRO [Federal Data Processing Service], the Ministry of Science and Technology, SEI [Special Secretariat of Informatics], UNICAMP [Campinas State University], CTI [Information Science Technology Center], CTA [Aerospace Technology Center], EMBRAER, and COBRA [Brazilian Computers and Systems, Inc].

The delegation was delighted with the TELEBRAS [Brazilian Telecommunications, Inc] Research Center (CPqD); and, according to Ye Long-fei, director of the Electronics Instrumentation Bureau in Shanghai, it was greatly impressed by the visit to UNICAMP. The major concern of the Chinese at present is how to organize, effectively, the relations between their universities and research centers.

Yuang Shu-xun, director of the Ministry of Electronic Industry's international department, noted that, this year alone, China produced 50,000 micros compatible with the IBM PC and XT. The current installed microcomputer equipment is 130,000 PC's and Apples. In the minicomputer segment, Wang Laboratories is experimenting on a joint venture with HP to manufacture equipment compatible with VAX. From the standpoint oftheir own development, the Chinese are most proud of the Great Wall 050microcomputer, manufactured by Beijing Computer, which is capable of processing the 8,000 characters in the Chinese language.

He disclosed: "We are in Brazil for much too short a time to correctly assess the policy on information science. But it seems to us to be very good for the country. Engineers and researchers are working very closely in the industries. And this is good." In his opinion, Brazil has a well defined course of action in the field of consumer electronics, and in the management of the technological training. And the same thing holds true of information science.

2909

Brazil, PRC May Build Remote Sensing Satellite Jointly

36990036a Rio de Janeiro O GLOBO in Portuguese 11 Dec 87 p 7

[Text] Sao Jose dos Campos—Now, during January, Brazil is due to sign with China an agreement for the development, launching, and operation of a remote sensing satellite. For this purpose, scientists and representatives from the Brazilian Commission for Space Activities (COBAE) will travel to Beijing ,where they will also decide on balanced commercial guidelines involving exchanges of parts, components, systems, and technologies related to space.

The Brazilian participation in the Chinese satellite, to be launched in 1991, will be, at most, a third; currently equivalent to an investment of $40 million (2.64 billion cruzados). The matter is being studied with interest by the EMFA [Armed Forces General Staff], where the approval of the agreement is contingent only on the procurement of funds.

COBAE has also already decided that the cooperation with China cannot interfere with the Brazilian space program, which has specified precisely for 1991 the launching of the first national remote sensingsatellite. According to the general director of the Institute of SpaceResearch, Marco Antonio Raupp, the Brazilian satellite is essential as a step toward the gaining of new information on, and mastery of space technology. Raupp explains that, at the same time, the cooperation with-China is important from a commercial standpoint; because it could represent the construction of earth stations in Brazil for the reception of the Chinese satellite's images, the sale of technology to interpretthe data procured by satellite, and the opportunity for INPE [NationalInstitute of Space Research] to sell the Chinese satellite's services as well.

The interest on the Chinese side is commercial and technological. Brazil is currently the second largest world consumer of satellite photos, surpassed only by the United States. INPE alone markets 8,000 images per year, sent by the Landsat (American) and Spot (French) satellites. The Chinese are also interested in procuring, through triangular or direct transactions with Brazil, components, parts, and subsystems in the electronics and fine mechanics area, which they have been unable to purchase from other Western countries.

According to the Chinese Ministry for Astronautics' director of international cooperation affairs, Yu Fu-sheng, the program to develop the first large-scale remote sensing satellite in China is in the second phase, initiating the manufacture of subsystems.

2909

Soviet Relationship With Brazilian Ferroalloy Company

36990045b Rio de Janeiro O GLOBO in Portuguese 9 Jan 88 p 22

[Text] Belo Horizonte—Ayres Brothers, a medium-sized accounting firm in the metropolitan region of this capital, is in the final phase of negotiations with the Soviet enterprise, V.O. Stankoimport, to import technology for the manufacture of industrial lathes in Brazil. At the present time, the Brazilian company is engaged in market research to determine the lathes that are to be produced. However, the trend is for Ayres Brothers to decide on four models of vertical lathes and two models of the Monfort type, used in smelting, ironwork, and automobile parts industries.

According to the commercial director of Ayres Brothers, Lincoln Ayres, the market research will be completed during this half-year, when a decision will also be made on the manner in which the agreement is to be concluded with Stankoimport, the entity in the Soviet Union responsible for foreign trade involving machine tools. Lincoln Ayres claims that a joint venture might be formed with the Soviet enterprise, or the technology might only be absorbed by Ayres Brothers, with the payment of royalties to Stankoimport.

In addition to the business with the Soviets, Ayres Brothers, whose fundamental activities lie in the tooling sector, is investing $25 million (1.8 billion cruzados) in the establishment of a ferroalloy plant in Rosario, Maranhao. Planned to go into operation by the end of 1989, during its first phase the plant will have a production capacity of 30,000 tons per year of high carbon ferromanganese, and 19,000 tons per year of manganese ferrosilicon.

2909

Arab Countries to Acquire Brazilian Military Technology

Libyan Military Mission Discussing High-Tech Arms Deal

36990046a Rio de Janeiro O GLOBO in Portuguese 21 Jan 88 p 21

[Text] A Libyan military mission is in Brazil to conclude one of the largest arms deals ever made by the Brazilian weapons industry, worth approximately $2 billion (158 billion cruzados). The Libyan mission comprises 12 colonels headed by Colonel Ahmed Mahmoude Ali, who is in charge of war materiel and is very close to President Mu'ammar al-Qadhdhafi. The mission met yesterday with Army Minister Leonidas Pires Goncalves and Aeronautics Minister Moreira Lima.

Foreign Minister Abreu Sodre and Armed Forces Chief of Staff Paulo Roberto Camarinha will receive the Libyan mission this morning. The Libyans are interested in buying Osorio tanks and Leo and Piranha missiles. The transaction is being carried out within the framework of the recently created Brazilian-Libyan Joint Committee.

This committee held a meeting in October 1987 to facilitate trade between the two countries, including payment in Libyan oil for Brazilian weapons.

On that occasion, it was agreed that Libya would supply 40,000 to 50,000 barrels of oil per day to Brazil in payment for the weapons and for the services of Brazilian companies working in Libya. Itamaraty representatives on the joint committee include Ambassadors Luis Vilarinho, chief of the Trade Promotion Department, and Sampaio do Amaral, chief of the Near East Department.

On paper, this transaction is larger than the one closed a few days ago with Saudi Arabia. The Saudi ambassador was at Itamaraty yesterday working on the details of his country's deal, which in its initial stage provides for the purchase of 500 tanks (for a total of $1 billion). The Libyan deal, however, includes two other stages apart from the purchase of tanks: the assembly of 500 Brazilian tanks in Libya and, in the medium term, the purchase of 500 more tanks totally manufactured in Saudi Arabia. [as published] The total deal will be worth $5 billion.

Brazil has sold other weapons to Libya in the past. It reequipped the Libyan Army with Urutu and Cascavel tanks, in a deal worth close to $200 million. This trade was suspended in 1983 after an incident in which Libyan planes were caught flying over Brazilian territory.

The Libyans are visiting Brazil at the invitation of ENGESA [Specialized Engineers, Inc], manufacturers of war equipment such as the Urutu and Cascavel tanks and the Osorio tank,the latest star in the Brazilian arsenal.

Offers Missile Development Aid

36990046a Sao Paulo O ESTADO DE SAO PAULO in Portuguese 22 Jan 88 p 2

[By Roberto Godoy]

[Text] The Libyan military mission that is currently visiting Brazil is mainly interested in the development of a whole "family" of the MB/EE series of ballistic missiles to carry conventional warheads weighing up to 1 ton distances of 100, 600, and 1,000 km. This series is being designed by Orbita-Special Systems, the enterprise the delegation will visit today at the invitation of ENGESA [Specialized Engineers, Inc]. The delegation is headed by Ahmed Mahmoude Ali, director general for armament supplies. The Libyan delegation is made up of 15 specialists, 12 of whom are Armed forces officers. Their visit is being sponsored by ENGESA.

According to sources from the War Materiel Department (DMB) of the Army Ministry, Mahmoude Ali expressed his government's interest in financing the program, purchasing the first lot of the series, and then placing an order that guarantees Libya access to the technology. The MB/EE-600 and MB/EE-1000 missiles will be developed on the basis of knowledge acquired in the manufacture of the experimental scientific rockets Sonda II and Sonda IV.

The Libyan delegation is comprised of high-level personnel. For instance, Mahmoude Ali reports directly to leader Mu'ammar al-Qadhdhafi, and has the authority to sign contracts for any war material.

The product that elicited the most interest by the delegation was the battle tank Osorio EE-T1, which is equipped with a 120-mm cannon. This is the model that passed technical and field tests in Saudi Arabia last year and was selected as the combat vehicle for that country's Army.

As far as tactical missiles, the MB/EE-150 will be the first model with a dual launcher mounted on a semi-armored chassis. This model will be electronically autonomous, meaning that a 3- or 4-man crew will be able to launch the missiles without any outside support. Its range carrying a 500-kg warhead is estimated at 100-150 km. According to engineer Jose Luiz Whitaker Ribeiro, "this missile hit the target center 50 percent of the time in tests."

That missile measures more than 12 meters and has a delicate guidance system, with an inertial device and other precision sensors to make last-minute flight changes. In the opinion of an officer-engineer from the war materiel sector of the Brazilian Army, the development of the MB/EE "family" will require at least 5 years from the time the contract is signed until the first firing tests are conducted. Investments will need to reach $400 million per year in order to complete the project.

Saudi Arabia Acquires Brazilian Tank Technology

36990046 Sao Paulo FOLHA DE SAO PAULO in Portuguese 8 Jan 88 p A-7

[By Dalton Moreira]

[Excerpt] The Brazilian military industry bid to supply 1,200 heavy tanks to Saudi Arabia has been accepted. This will be the biggest contract for the sale of Brazilian arms abroad ever. The contract involves $5 billion (462.5 billion cruzados at the unofficial exchange rate and 369.5 billion cruzados at the official exchange rate). The winner is the EE-T1 Osorio tank, which is manufactured by ENGESA [Specialized Engineers, Inc], an enterprise located in Sao Jose dos Campos, Sao Paulo State (97 km northeast of Sao Paulo city). The contract will be signed by the end of the month.

A Brazilian delegation made up of representatives of Itamaraty, the Army, and the industry has been in Riyadh (capital of Saudi Arabia) since December 1987 negotiating the various clauses of the contract, such as technology transfer, the deadline for the installation of a factory to produce Osorio tanks in Saudi Arabia, training of personnel, and terms of payment. By the end of this year the Saudi Arabian Army will receive 236 tanks. In order to speed up production of the tank, ENGESA has already received $165 million (15.2 billion cruzados at the unofficial exchange rate and 12.2 billion cruzados at the official exchange rate) from the National Economic and Social Development Bank (BNDES).

Osorio Tank Characteristics Outlined

36990046 Sao Paulo FOLHA DE SAO PAULO in Portuguese 8 Jan 88 p A-7

[Excerpts] The EE-T1 Osorio is a heavy tank that weighs 42 tons and can be equipped with either a 105-mm or a 120-mm gun. The result of a highly advanced development program, it is fitted with a computer-controller firing system. For example, if one were to target the gun, it would not fire as long as there were a margin of error. The tank has a composite armor which is both highly resistant and light.

Automatic sensors are used to stabilize the tank's turret. It is also equipped with night vision, which permits the sighting of targets invisible to the naked eye. The tank has laser sighting and rangefinding equipment. The target is sighted through a video camera and can be easily hit within a range of 4 km.

/12913

Cuba Interested in Brazilian Biotechnology

36990046b Madrid EFE in Spanish 0810 GMT 22 Jan 88

[Text] Rio de Janeiro, 21 January (EFE)—Brazil and Cuba will intensify cooperation in the areas of health and biotechnology, Cuban Foreign Minister Isidoro Malmierca said today in this capital.

Foreign Minister Malmierca, who had to endure the sweltering Rio de Janeiro summer, toured the installations of the Oswaldo Cruz Foundation, where the key bilateral programs are being implemented.

Malmierca noted the importance of bilateral cooperation for scientific development in the two countries and urged the Cuban and Brazilian Governments to expand their joint efforts in other scientific areas.

He noted that although this is a courtesy visit to Brazil, it has resulted in the signing of new agreements between the two countries "which have a lot to give each other."

Cuban advisers are now in Brazil cooperating in dengue control and receiving medical training.

The Cuban minister, who met with President Jose Sarney and Foreign Minister Abreu Sodre yesterday in Brasilia, will travel to Sao Paulo tomorrow, Friday, 22 January, and from there he will depart for Montevideo, Uruguay, on Sunday, 24 January.

/12913

Brazilian Official Denies Sales of Weapons to Iran

14262327 Brasilia Domestic Service in Portuguese 2100 GMT 26 Jan 88

[Text] Foreign Minister Abreu Sodre today denied that Brazil had sold any type of weapons to Iran, but confirmed that the government is closing a deal to supply weapons to Libya, for a possible total of $2 billion.

Abreu Sodre said the weapons sales that are being negotiated with Libya involve only defensive weapons. He added that the rockets and missiles that Brazil will provide to Libya have very short ranges. Sodre made this remark at the Brasilia Air Base after returning from Suriname.

Sodre stressed that he did not know anything about U.S. Government displeasure concerning the commercial operation with Libya. According to a press report, the Reagan government protest was transmitted to the Brazilian ambassador in Washington, Marcilio Marques Moreira.

Libya Not To Releive Offensive Weapons From Brazil

14281548 Madrid EFE in Spanish 0306 GMT 28 Jan 88

[Text] Brasilia, 27 Jan (EFE)—Brazilian Foreign Minister Roberto de Abreu Sodre today confirmed that Brazil will sell weapons to Libya.

"However, they are not offensive weapons," Sodre said.

Asked if he considered the "Leo" and "Piranha" rockets and the "Astros-2" multiple rocket launcher as defensive weapons, the foreign minister said they are short-range weapons, as established in a contract that will be signed soon.

Concerning a note the U.S. State Department sent yesterday to the Brazilian ambassador to Washington, Marcilio Marques Moreira, describing as "inappropriate" the sale of weapons to Libya, the foreign minister said he is still unaware of this note. However, he said it "will have no effect."

De Abreu Sodre went on to say the sale of weapons to Libya will total $2 billion.

The foreign minister does not know if the materiel purchased by the Libyans would then be resold to Iran, as claimed by the U.S. Government, "because Brazil has a course of action concerning arms issues that does not allow for the sale of war materiel to nations that are in a state of war."

The Libyan military delegation, which is still in Brazil negotiating the purchase of "Osorio" tanks, rockets, and a multiple rocket launcher, might sign a contract with the Brazilian enterprise "Engesa" [Specialized Engineers, Inc] tomorrow.

Brazilian Army Denies Role in Weapons Sale to Libya

14300153 Sao Paulo O ESTADO DE SAO PAULO in Portuguese 29 Jan 88 p 2

[Text] Through its Social Communications Center, the Army yesterday announced that it has nothing to do with the possible export of Brazilian-made weapons to Libya and that the Libyans came to Brazil at the invitation of ENGESA [Specialized Engineers, Inc], the manufacturer of combat vehicles. Army officers revealed that the Army only provides guarantees on the quality of weapons that have been tested by its technicians in cases of arms export operations. According to them, the War Materiel Department (DMB) in some instances can deny authorization for an arms export deal if the country is in need of a particular weapon.

The Army Social Communications Center explained that the arms export policy is managed by Itamaraty and the National Security Council, which together evaluate the advisability of exporting military materiel to a particular country, always trying to avoid misunderstandings with friendly countries. For that reason, according to the Social Communications Center, Brazil does not buy war materiel from Israel nor does it sell it to Israel, because the Arab countries, especially Iraq and Saudi Arabia, are important trade partners.

Likewise, the officers blamed the press for trying to involve the Army in the export of Brazilian-made weapons to Mu'ammar al-Qadhdhafi. They pointed out that contrary to what has been reported, Army Minister Leonidas Pires has at no time met with the Libyan delegation now visiting the country.

Yesterday, officers at the Army General Headquarters said there is only a remote possiblity Brazil will sell arms to Libya, because such an operation would hurt negotiations now under way for the sale of Osorio tanks to Saudi Arabia by ENGESA, which has already won an international bid for such a sale.

Asked about this matter yesterday afternoon, Foreign Minister Abreu Sodre said that he would not comment on it, because he does not want "to engage in polemics."

Brazil: Government Justifies Weapons Sale... to Libya

14300043 Madrid EFE in Spanish 2304 GMT 29 Jan 88

[Excerpt] Brasilia, 28 Jan (EFE)—The Brazilian Government today justified the sale of weapons to Libya on the grounds that the country is facing a foreign debt problem and a serious economic crisis. The justification comes in the wake of criticism and warnings from the U.S. Administration.

"We cannot afford to lose a $2-billion deal when Brazil is having such a difficult time," a Brazilian diplomatic source told EFE today. The source said it had no knowledge whether these weapons would be resold to Iran.

For his part, Brazilian Foreign Minister Roberto de Abreu Sodre has said he "is not seeking to promote controversy with the United States." The U.S. Government yesterday termed "deplorable" the minister's explanations on the sale of weapons to Libya.

"I have already said what I have to say and I will add nothing else," Abreu Sodre maintained. Last Wednesday he officially admitted that Brazil was selling "not offensive but defensive" weapons to the government of Colonel Mu'ammar Abu Minyar al-Qadhdhafi. [passage omitted]

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